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Coordination, Learning and Multi-organizational Projects: The case of the Dutch Shipbuilding Industry

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Coordination, Learning and Multi-organizational Projects: The case of the Dutch Shipbuilding Industry

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door

Roland Cornelis Levering

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Tilburg, November 2014
Roland Levering

Chapter 1

Constructing the Hull:
the Dutch Shipbuilding Industry

1.1 Introduction

This dissertation addresses temporary interorganizational collaboration in the Dutch shipbuilding industry. In this introductory chapter, we[2] will construct the hull of this dissertation by presenting the case of the Dutch shipbuilding industry, state the research problem addressed in this dissertation, and present an outline with the chapters and the links between them.

The ships studied in this dissertation are among the largest man-made, movable objects in the world; they are complex capital goods which can be deployed all over the world. Ships in general have many applications such as, among others, bulk and container shipping, maintenance and support for the offshore industry, dredging, installation of pipelines and cables on the seabed often at considerable depth, constructing windmill parks at sea, and deployment for military operations. How are these complex capital goods produced? In general, a shipbuilding project entails several phases, which run roughly from contracting and engineering to production and commissioning. A group of organizations, often consisting of a main contractor, which is usually the shipyard, and several subcontractors, interact closely for the timely delivery of the ship according to specifications and within budget. The interaction between the different organizations is especially visible in the project phase of production where the actual construction of the vessel takes place and the various activities of the organizations are performed. Multi-organizational projects are the primary

[2] Throughout this dissertation, I use the plural form to acknowledge the contributions of my supervisors. Beside chapter two (which is based on a published article as I explain in a separate footnote) are the other chapters written by myself in collaboration with my supervisors.

organizational form through which shipyards coordinate and organize their core business: constructing vessels. As Hobday (2000) argues, the project-based organization is widespread in the traditional industry of shipbuilding and the shipbuilding projects they conduct can be considered a temporary organizational form. These temporary organizational forms have a different task at hand; operate in a different context, under a different notion of time as compared to non-temporary organizational forms.

Over the past decades, the shipbuilding industry became more global, delivery times of vessels shortened while their technical complexity increased (see also chapter two of this dissertation) which created a strong cost competition between shipyards. Over time, the production of cargo, bulk and container vessels almost completely moved to low-wage countries such as South Korea, forcing the European shipbuilding industry in general and the Dutch shipbuilding in particular to focus on alternative segments of the market like technological complex vessels. Nowadays, the global shipbuilding industry constitutes a dynamic and volatile environment which poses a great challenge to the Dutch shipbuilding industry. As part of the European shipbuilding sector, the Dutch shipbuilding industry has to compete with large shipbuilding nations such as China, Korea and Japan whereas other nations such as Brazil, Russia and India are quickly developing their shipbuilding industries. How to sustain or improve competitive advantage in such a market, as a sector and as individual organizations operating in the industry as both competitors and co-makers? This leads the industry to initiate a collective effort to reinforce the competitive position of the

Dutch shipbuilding industry by developing improved models and tools for interorganizational collaboration.

1.1.1 The Dutch shipbuilding industry

With an overall employment of 30,000 fte and an annual turnover of six billion euro[3], the Dutch shipbuilding industry is an important part of the Dutch economy that is operating on a global scale. Due to the changing global shipbuilding industry described above, the Dutch shipbuilding industry was forced to alter its course and has effectively focused on niche markets for the production of specialized ships such as dredging vessels, pipe layers, and heavy lifting vessels. But also by facilitating customer demands throughout the production process, for example with serial-like construction of tugboats, navy patrol, and off-shore support vessels.

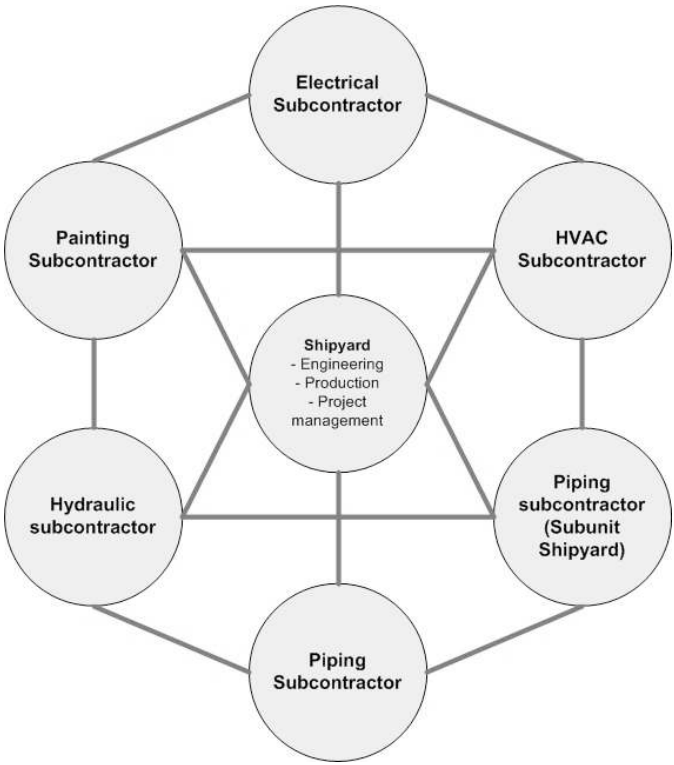
The highly complex, specialized vessels constructed by the Dutch shipbuilding industry require the expertise of various specialized, legally independent organizations. In order to execute these types of projects and incorporate customer demands in a flexible way throughout the construction process, Dutch shipbuilding projects involve temporary production networks of different sets of organizations, each with its own discipline and expertise. These specialized organizations have to collaborate closely with one another in order to coordinate the highly complex and interdependent work. The production network as temporary organizational form experiences a higher need for coordination and collaboration among the set of participating organizations due to the high

[3] Source: www.scheepsbouw.nl/feiten_cijfers

interdependence and complexity of jointly constructing a specialized vessel in a limited amount of time.

Figure one shows a simplified example of a shipbuilding project. The shipyard is depicted as a central hub since shipyards operate as main contractors, bearing financial responsibility and maintaining the contact with the customer. We elaborate on the role of the shipyard in chapter two of this dissertation.

Figure 1. An example of a temporary production network in the Dutch shipbuilding industry



1.1.2 Integrated Partnership

In 2008, industry actors acknowledged some major challenges for the Dutch shipbuilding industry. For example, they perceived the collaboration between the different organizations as suboptimal and leading to failure costs[4], a less competitive vessel in terms of delivery time and market price, and insufficient learning across shipbuilding projects. These challenges were the driving force for the industry actors to initiate in 2008 the largest program of process optimization in the Netherlands (*integrated partnership*) that ran until 2013. The goal of the program was to pool resources and to integrate shipbuilding processes while maintaining and reinforcing the competitive position of the Dutch industry as a whole. Two main shipyards and several subcontractors for, among others, painting, piping, electrical systems, hydraulics, and air conditioning systems participated in the program. The program included eleven projects related to technological and social innovation as well as innovative entrepreneurship. A number of projects involved the contributions of third parties such as several marine research institutes, Delft University of Technology and the Center for Innovation Research at Tilburg University. The program was directed by the industry itself and subprojects pertained to, for example, life cycle engineering, knowledge management, and product definition.

One of the subprojects concerned the collaboration process between participating organizations in the shipbuilding projects. The subproject strived for process redesign and developing tools and

[4] Failure costs are preventable costs associated with suboptimal collaboration between participants. For example, a lack of communication between participants leading to the same mistakes across projects.

commitment for collaboration between the organizations involved. The rationale behind this subproject was that technological development in itself was not sufficient for improving the competitive position of the Dutch shipbuilding but needed to be accompanied by improved interorganizational collaboration and a commitment of all actors involved to contribute to that. The Center for Innovation Research at Tilburg University was involved in this particular subproject via three doctoral students focusing their research on factors influencing the quality of the collaboration between legally independent organizations which are functionally interdependent.

1.2 Research problem

As described in the previous section, shipbuilding projects can be considered a temporary organizational form. The concept of temporary organizational forms received considerable scholarly attention in recent years and has been studied in a rich array of industries, often under various labels (Bakker, 2010). The notion of a temporary organizational system is not as novel as it might sound. One of the first scholarly efforts to appear was the study of Miles (1964) 'On Temporary Systems' about innovation in education. Since then, the work on the many faces of temporary organizational forms has increased considerably over time. A significant part of research appeared around 1995 (Packendorf, 1995; Hellgren & Stjernberg, 1995) with one of the most seminal works being undoubtedly the article of Lundin and Soderholm (1995) discussing temporary organizational forms in the widely-adopted aspects of time, team, task, and transition. A more recent wave of research stressed the

importance of the context for temporary organizational forms (Engwall, 2003; Turner & Muller, 2003; Grabher, 2004; Bechky, 2006). The significance of the context of IO projects for their functioning and interior processes has gained considerable attention in the current debate and in his literature review Bakker (2010) concludes that "the contextual perspective, highlighting the importance of the exterior environment of temporary organizational forms for interior processes, is one of the major accomplishments in temporary systems research in recent years" (p. 481). Nonetheless, Bakker (2010) also stated that "even though a fairly rich tradition of work on temporary organizational forms exists, only since quite recently does the field seem to regard itself as a distinct category of interest" (p. 467; see also Lundin & Soderholm, 1995; Packendorf, 1995).

This dissertation addresses two gaps in the literature on temporary organizational forms: on the one hand the lack of research on interorganizational temporary forms in general and multi-organizational forms in particular and on the other hand the lack of research on the coordination within these organizational forms.

First, the distinct field of research on temporary organizational forms has been primarily concerned with temporary collaborations within organizations, whereas temporary interorganizational forms are remarkably understudied (Janowicz-Panjaitan, Bakker & Kenis, 2009). Temporary collaborations between organizations have grown significantly in the past years (Muthusamy & White, 2005) and the importance of temporary interorganizational forms cannot be denied in the modern economy (Grabher, 2002). Although other types of

temporary interorganizational forms exist such as strategic alliances or joint ventures, the majority of the scarce literature studies interorganizational projects (henceforth IO projects). IO projects are generally defined as "two or more organizational actors from distinct organizations working jointly to create a tangible product/service in a limited period of time." (Jones & Lichtenstein, 2008, p. 234). Despite their significance, IO projects attracted scant research attention (see Jones & Lichtenstein, 2008; Grabher, 2004; Engwall, 2003; Ness & Haugland, 2005). The understudied phenomenon of the IO project is also observed in the network literature in the form of the whole network; defined as "a group of three or more organizations connected in ways that facilitate achievement of a common goal" (Provan, Fish, & Sydow, 2007: 482). Even more, the scant research on IO projects has mainly addressed dyadic as opposed to multi-organizational settings. IO projects consisting of three or more actors constitute a significant different context for collaboration than dyadic projects since social exchanges between actors become generalized, i.e. reciprocation for contributions to the project become blurred (Das & Teng, 2002). We address this issue later on and in chapter four.

The second gap in the literature on temporary organizational forms concerns the issue of coordination in IO projects. Only a few studies specifically address coordination (Janowicz-Panjaitan, Bakker & Kenis, 2009) although coordination becomes a core issue for IO projects since these temporary organizational forms have a different task at hand, operate in a different context, under a different notion of time as compared to non-temporary organizational forms. These

differences are deemed to have a significant impact on coordination (Okhuysen & Bechky, 2009): the prevailing argument in the literature is that the temporary nature of IO projects prevents the development of effective coordination mechanisms to accomplish the task at hand. The classical project management toolkit has several shortcomings (Packendorf, 1995) among which an important one for interorganizational coordination: taking social interaction into account. Temporary organizational forms are considered to be relatively less hierarchical and bureaucratic as opposed to non-temporary organizations (Kadefors, 1995). Meyerson, Weick, and Kramer (1996) argued that temporary organizations rely on 'swift trust' to quickly come to a workable situation in which organizations can collaborate to accomplish a common goal in the limited amount of time. Bechky (2006), on the other hand, stated that temporary organizations are not as loose and unstructured as they appear to be. In contrast, temporary organizations build on underlying structured role systems which are enacted in specific temporary settings.

Powell (1990) already stated that we know little of how coordination is achieved in temporary settings which relies to a lesser extent on formal structures and in which both collaborative and competitive connections exist between participants. Bechky (2006) acknowledged this void in the literature on temporary organizational forms. To date, our understanding of how coordination comes about in temporary forms characterized by multiple actors jointly executing a complex task remains scarce. We address this issue theoretically in chapter three and empirically in chapter five.

A complicating factor for coordination of a multi-organizational project often mentioned in this dissertation is complexity. In this research context we view complexity of the shipbuilding projects as the number of project participants and the interdependencies between them, as well as technological complexity of the specific vessels. We view shipbuilding projects and their complexity in terms of systems and subsystems (Shenhar, 2001). Such a conceptualization of complexity implies that shipyards operate as a multitechnology firm which "can coordinate loosely coupled networks of suppliers of equipment, components, and specialized knowledge and maintain a capability for systems integration" (Brusoni, Prencipe, & Pavitt, 2001). Such system integrators must have the capabilities to integrate the various subsystems, i.e. the (number of) suppliers and their interdependencies and the scope and technical complexity of the project. This is especially the case in the shipbuilding industry since "the more complex, high technology, and high cost the product, the more significant systems integration becomes to the productive activity of the firm" (Hobday, Davies, & Prencipe, 2005).

When studying coordination in multi-organizational projects both gaps in the literature on temporary organizational forms are relevant. These two gaps are best studied in combination since coordination of IO projects relies on a lesser extent on formal structures as hierarchies and rules (Meyerson et al., 1996; Miles, 1964) and require relatively more informal social mechanisms such as reciprocity, socialization and reputation (Jones, Hesterly, & Borgatti, 1997). However, these informal social mechanisms differ for multi-organizational settings:

Restricted social exchange occurs when two parties directly exchange favors with each other, which is also known as dyadic or mutual exchange. In contrast, generalized social exchanges take place among a group of at least three parties, and *there is no direct reciprocity among them* (Das & Teng, 2002, p. 448, original emphasis).

Consequently, coordinating multi-organizational projects based on informal mechanisms in addition to traditional formal mechanisms becomes problematic since coordination conditions of accountability, predictability, and common understanding (Okhuysen & Bechky, 2009) are less visible and direct as compared to non-temporary organizational forms or dyadic interorganizational forms. In other words, generalized reciprocity complicates coordination in multi-organizational projects since it becomes less clear which actor is expected to do what as compared to dyadic IO projects or non-temporary organizational forms. This also applies to the multi-organizational projects in the Dutch shipbuilding industry since the shipyard as lead organization in the whole network experiences the same indirect reciprocity as their suppliers. This issue is addressed in chapter four of this dissertation.

The lack of understanding on coordination in temporary organizational forms needs to be seen in relation to the scarce research attention for multi-organizational projects. These shortcomings of the temporary organizational forms literature form the basis for this dissertation. The focus is on coordination of multi-

organizational projects, excluding dyadic interorganizational relationships of a temporary nature.

1.3 Methodological approaches and dissertation outline

In order to study our research problem - the lack of research attention for the multi-organizational project and the understanding of coordination in this type of temporary collaboration - we could not make use of an articulated or testable theory since, to date, "there is a lack of rigorous and systematic theoretical development in the literature on TOs" (Janowicz-Panjaitan, Bakker & Kenis, 2009: 80). Therefore, this dissertation is of an explorative nature, we acted as embedded researchers on the various shipbuilding projects studied in this dissertation, and adopted a multi method approach to understanding coordination of multi-organizational projects. We relied on observations of interactions between actors on the shipbuilding projects, minutes of construction meetings, and semi-structured interviews with participants in the projects. Such a qualitative multi-method approach using shipbuilding projects as case studies is deemed relevant since these 'revelatory' cases are best suited for gaining insight in understudied phenomena (Yin, 2009).

The data is primarily based on semi-structured interviews since this dissertation focuses on concepts which are relatively understudied but not unknown. Because of the state of the research on coordination in multi-organizational projects, the empirical chapters build on explorative and emergent methodologies from the grounded theory approach (Glaser & Strauss, 1967). Constant comparison is

used for all empirical chapters, which means that data collection and analysis took place simultaneously. Overall, the different research processes proceeded in an open but guided fashion.

An overview of the collected data for the empirical studies of chapters one, three and four is given in table one. The data for chapter one involved interviews with current employees in the Dutch shipbuilding industry and retired shipbuilders. The first category of respondents was interviewed during the period April – July 2010 and the second during the period July – October 2011 and August – September 2012. The data for chapter three involved semi-structured interviews and observations made during construction meetings. This data was collected from October 2011 until October 2012 on a single multi-organizational project. The data for chapter four was collected during the period February 2013 – September 2013 and involved semi-structured interviews and observations on two consecutive shipbuilding projects.

Table 1. Data overview of the dissertation

Chapter	Research setting	Data collected
2	The Dutch shipbuilding industry 1950 – 2010	25 semi-structured interviews
4	Multi-organizational project concerning the construction of a large, unique and complex vessel	16 semi-structured interviews
		Observations of 50 construction meetings
5	Two multi-organizational projects concerning the construction of highly similar but complex vessels	113 observations during various types of meetings
		10 semi-structured interviews

Chapter 2 | **Continuity and Change in Interorganizational Project Practices: The Dutch Shipbuilding Industry, 1950-2010**

The Dutch shipbuilding industry has a longstanding tradition in project-based production. Recently, industry actors have acknowledged a serious misfit between interorganizational project practices, defined as behaviors related to collaboration, and interorganizational project demands, defined as environmental conditions. This misfit leads to a weaker competitive position due to higher communication and production costs, and longer production times. However, the causes of this misfit remain unclear. Among project researchers there is a growing awareness that history has a

major influence on contemporary practices in interorganizational projects, suggesting that some of the causes of the present-day misfit may be rooted in the past. This first chapter studies historical developments of interorganizational project practices in Dutch shipbuilding projects, in order to understand to what extent contemporary misfit in project practices is rooted in the past and results from path dependencies and lock-ins. We answer the following research question: How did interorganizational project practices and demands in the Dutch shipbuilding industry develop between 1950 and 2010 and to what extent do these developments help us understand the current misfit between project practices and demands? Our results show that a web of self-reinforcing mechanisms at least partially explains the current misfit in the Dutch shipbuilding industry. This chapter answers to the conceptual call by Sydow et al. (2009) and supplements path dependence literature by showing that self-reinforcing mechanisms causing path dependence can be separated analytically, but are intertwined empirically.

This chapter forms an empirical exploration of the research problem, showing how coordination and collaboration practices in the Dutch shipbuilding industry are shaped over time. It has been argued that the internal workings of IO projects need to be seen in light of their history and context (Engwall, 2003). This chapter takes an industry-level perspective, illustrating temporary collaboration in the Dutch shipbuilding. By showing how the current suboptimal collaboration is shaped by path-dependent processes, this chapter sets the context of this dissertation and forms the foundation for the following chapters.

Chapter 3 | **Collaborative Routines in Interorganizational Projects**

The concept of organizational routines has been extensively studied but research efforts have focused predominantly on intra-organizational routines leaving the study of routines at the interorganizational level largely unaddressed. Given the growing prevalence of interorganizational projects, often embedded in repeated relations, this theoretical paper argues that interorganizational coordination routines are potentially important and their emergence needs to be understood more deeply. The coordination of activities of legally autonomous but functionally interdependent actors is a core issue in these projects. The goal of this chapter is to deepen our understanding on how coordination routines can emerge in interorganizational projects. This goal is accomplished by theoretically exploring insights from the capabilities and the practice literature and systematically relating these to the interorganizational project dimensions of context, time, task and team. Several antecedents for the emergence of interorganizational coordination routines and their expected effects are identified.

Chapter three theoretically explores the notion of interorganizational routines for the coordination of multi-organizational projects since chapter two showed the need for collective practices in light of changing environmental demands. This chapter theoretically explores if and how coordination routines on an interorganizational level develop. Studying routines at the interorganizational level is needed for understanding coordination of IO projects characterized by multiple actors which are functionally interdependent for achieving collective goals.

Chapter 4 | **Quid Pro Quo: Collaborative Learning and Social Exchange in Multi-organizational Projects**

This chapter studies collaborative learning in multi-organizational projects. It argues that there is a fundamental difference between dyadic and multi-organizational projects regarding collaborative learning, viewed as learning *from* as well as *with* each other, due to generalized reciprocity. The goal of this chapter is to study implications of the multi-organizational project setting for collaborative learning in order to strengthen the theoretical foundation for research on interorganizational learning. The question arises what the implications for collaborative learning are when social exchanges between organizations within the multi-organizational project become generalized. We answer the following research question: How does collaborative learning take place in multi-organizational project settings? A case study of a large, complex multi-organizational project in the Dutch shipbuilding industry is conducted to study collaborative learning in a generalized reciprocal context. Results indicate conditions for collaborative learning as well as the influence of generalized reciprocity types. The study provides managers with insights into the processes that drive the unique management challenges in multi-organizational projects.

This chapter develops the argument that multi-organizational projects display fundamentally different implications for coordination compared to dyadic projects. Whereas expectations about who is supposed to contribute what to the IO project is rather straightforward in a dyadic setting, this becomes less clear and visible in a multi-organizational project making the classic project management tools applied in dyadic settings less appropriate.

Addressing the multi-actor issue and studying generalized reciprocity sheds light on how three or more organizations coordinate interdependent activities within a single multi-organizational project.
This chapter studies coordination within a single multi-organizational project showing empirically the collective effort of coordination which is theoretically discussed in chapter three.
This chapter studies the research problem empirically shown in chapter two and theoretically deepened in chapter three within a single multi-organizational project.

Chapter 5 | **Network Learning across Multi-organizational Projects**

In today's economy organizations increasingly rely on multi-organizational projects for the delivery of complex products and systems. This empirical paper studies network learning, i.e., learning by a group of organizations, *as a group*, in order to shed light on how coordinating multi-organizational projects is collectively learned. Much of the learning literature treats the interorganizational level as a context for learning instead of a learning entity itself. The question arises how organizations collectively learn to coordinate multi-organizational projects. A case study of two consecutive and highly similar multi-organizational projects in the Dutch shipbuilding industry shows how aspects of coordination change from the first multi-organizational project to the second, demonstrating network learning. The results show that the underlying network of ties between actors facilitates network learning processes of collective anticipation and awareness.

Chapter five builds on and extends the analysis in chapter four. The implication of generalized reciprocity presented in chapter four is that coordination of multi-organizational projects is a collective effort; raising the question how organizations collectively learn to coordinate these type of temporary collaborations. Chapter five looks at coordination across two multi-organizational projects whereas chapter four studies coordination within a single multi-organizational project.

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Chapter 2

Continuity and Change in Interorganizational Project Practices: The Dutch Shipbuilding Industry, 1950-20105

[5] This chapter is based on: Levering, R., Ligthart, R., Noorderhaven, N., & Oerlemans, L. (2013). Continuity and change in interorganizational project practices: The Dutch shipbuilding industry, 1950–2010. *International Journal of Project Management* 31(5), 735-747.

2.1 Introduction

Interorganizational projects are an increasingly prevalent phenomenon (Bakker et al., 2011). Besides in the shipbuilding industry (Ahola, Laitinen, Kujala, & Wikström, 2008) they can be found in different industries such as film making (Bechky, 2006) and theatre production (Goodman & Goodman, 1976). Jones and Lichtenstein (2008) set the interorganizational project apart from other forms of interorganizational coordination by identifying the temporary nature as its key distinction. This temporary nature is assumed to impact on the processes, practices, and behaviors taking place in these projects. We define interorganizational projects (henceforth IO projects) as "two or more organizational actors from distinct organizations working jointly to create a tangible product/service in a limited period of time." (Jones & Lichtenstein, 2008, p. 234). Interorganizational collaboration is often characterized by slow and painful processes and leads to mixed results, a phenomenon Huxham (2003) terms 'collaboration inertia'. Dille and Söderlund (2011) adhere to this viewpoint, stating that interorganizational projects "are usually plagued by challenges in terms of both cooperation and coordination and replete with delays and collaborative failures." (p. 481). Several studies show that such frictions even lead to failures (Polidoro, Ahuja & Mitchell, 2011).

In contemporary Dutch shipbuilding industry, shipyards, subcontractors, and suppliers collaborate in IO projects to produce complex vessels. Recently, industry actors acknowledged that contemporary interorganizational practices (e.g. with regard to communication and knowledge sharing) in Dutch shipbuilding projects are problematic and do not fit well with contemporary

interorganizational project demands (related to increased specialization and outsourcing). We define IO project practices as project participants' routine actions for coordinating activities and relations (Kostova & Roth, 2002; March & Simon, 1958; Windeler & Sydow, 2001), whereas project demands are seen as environmental conditions (cf. Wiersema & Bantel, 1993) that render certain collaboration practices more or less effective. Environmental, here, refers to the environment in which the project is embedded, for instance competition and technological development. When IO project practices do not match with project demands (i.e., environmental conditions), misfit occurs, and efficiency might suffer (Tushman & Nadler, 1978). To deal with problems caused by the experienced misfit, in 2008 two of the leading Dutch shipyards, together with a number of their subcontractors, started a large-scale program to improve the quality of interorganizational project practices. The program is part of a larger maritime innovation agenda which is supported by the Dutch ministry of economic affairs. The participants formulated their problems in their initial program report as follows:

"Specialization has led to fragmentation. Conflicting interests are a logical consequence and not infrequently impede collaboration. (…) But also assembling the necessary amount of knowledge, information and different disciplines, along with the fact that more than 70 per cent of the ship construction is delivered from outside the shipyard within a very tight schedule can sometimes cause great problems." (Integrative Collaboration report, 2008).

According to the program director of the improvement program, problems encountered within IO shipbuilding projects due to misfit are for instance: information exchange difficulties between organizations involved in the project, subjective (sub-optimal) purchasing decisions in buyer-supplier relationships, and a failure to capitalize on available expertise in the pre-project phase. These problems result in higher communication, learning and production costs, and longer delivery times of shipbuilding projects and as such corrode the competitive position of the Dutch shipbuilding industry on the global shipbuilding market. The participants in the maritime improvement program in The Netherlands responded to the experienced problems by setting goals that should make the industry more competitive and decrease the misfit between the project practices and demands. Under the umbrella of the overall goal of improved collaboration, the program aims at, among others, reducing failure costs, increasing employee motivation, and improving knowledge storage and exchange. The participants in the program state that: "an improvement in collaboration is needed in order to overcome the separation between the different phases in the construction process, between disciplines, and for joint risk management towards the customer"[6].

However, the causes of the misfit between IO project practices and demands remain unclear. Recent work in the field of project management proposes that current project practices and misfits should be understood in the context of historical developments (e.g., Engwall, 2003). Still, research on collaboration in IO projects typically

[6] Taken from the improvement program website, www.integraalsamenwerken.nl, 2012

does not put observed contemporary practices and demands in a historical perspective, thus neglecting the possibility that project practices may be reproduced from one temporary inter-organizational project to another (Windeler & Sydow, 2001), rather than reflecting adaptation to present circumstances and demands. If the historical dimension is left out of consideration, the implicit assumption is that IO project practices are only and immediately influenced by the current set of demands. This type of analysis neglects organizational inertia and path dependency (Sydow, Schreyögg, & Koch, 2009). Motivated by a strong belief in the importance of project history, scholars have recently called for the development of a history of projects (e.g., Jones & Khanna, 2006; Usdiken & Kieser, 2004). Responding to this call, we adopt a historical perspective in our examination of IO project practices in Dutch shipbuilding. A historical perspective, as propagated in the 'historic turn' in organization studies (Clark & Rowlinson, 2004), enables researchers to capture how project practices are over time influenced by changing forces in the environment, which is considered essential as environments, firm strategies, and organizations themselves change (Jones & Khanna, 2006). Also, it allows for the exploration of path-dependent aspects of project practices.

The main thrust of the present paper is that the misfit between contemporary IO project practices and demands in the Dutch shipbuilding industry is in part caused by historical conditions. IO project practices would follow external project demands in the absence of historically determined path-dependency. Currently, some of the IO project practices are in a misfit with the contemporary

IO project demands. For some practices we observe a lock-in, i.e., these practices have remained unaltered in spite of changes in project demands. Other practices did change, however, their adaptation to changing project demands followed a path-dependent process, in which possible alternatives that might have led to better fit were neglected.

2.2 Aim and outline

The goal of this paper is to examine how the observed misfit between IO project practices and demands in contemporary Dutch shipbuilding projects are partly rooted in the past and consequently are the result of path dependencies and lock-ins. We answer the following research question: *How did interorganizational project practices and demands in the Dutch shipbuilding industry develop between 1950 and 2010 and to what extent do these developments help us understand the current misfit between project practices and demands?* Our study on historical interorganizational collaboration aims to shed light on the historical roots of contemporary project practices. By doing so, it aids project managers and practitioners in better understanding the relationship between their project surroundings and their interior project management processes. Such an understanding will be supportive for managerial action since project management remains a difficult effort with many projects failing to meet their objectives within time and budget (White & Fortune, 2002). Answering to the call by Sydow et al. (2009), this paper supplements path dependence literature by applying its insights to an interorganizational collaboration context. We show that

although self-reinforcing mechanisms causing path dependence can be separated analytically, in the context of our study these mechanisms are strongly intertwined.

The paper is structured as follows. In the theoretical section contingency theory is used to theorize the notion of fit between IO project practices and demands. We complement the idea of fit, or, in our study, of misfit, with a historical view on lock-in effects and path dependency. In the empirical part of the paper we first describe the major developments in project demands on interorganizational collaboration between shipyards and subcontractors in Dutch shipbuilding during the past half century. After that, a description of changes in IO project practices is presented in order to arrive at the main aim of the paper: understanding how lock-in effects are partly at work and can explain the current misfit between IO practices and demands. For reasons of clarity, it should be noted that we do assume neither a fit nor a misfit in the Dutch shipbuilding industry in earlier times. Rather, the focus lies at understanding the *current* misfit. For that purpose, the developments in IO project demands and practices are described after which misfits due to path dependency and lock-in effects can be identified.

2.3 Theoretical background: misfit, path dependence and lock-in

The concept of fit is central to structural contingency theory and has received much scholarly attention (Siggelkow, 2001; Van de Ven, 1979). A basic assumption of structural contingency is that the internal organization, in order to be effective, must be aligned with its

external environment (Drazin & Van de Ven, 1985). Elements of the external environment include for example the level of competition and (technological) uncertainty (Eskerod, 1996; Jensen, Johansson, & Löfström, 2006). The fit between internal organization and environment is usually described as external fit (Lawrence & Lorsch, 1967). The present study concentrates on the (mis)fit between interorganizational project practices and the environment in which the project is embedded. If these practices do not match with environmental demands, problematic misfit occurs, and for example efficiency suffers (Tushman & Nadler, 1978). Practices, including project practices, tend to have a taken-for-granted, institutionalized nature (Nelson & Winter, 1982), which somewhat contradicts the view of IO projects as "a panacea against strategic persistence and structural inertia" (Sydow, 2009, p. 123). With regard to the environment of IO projects, it is worth noting that it is rarely stable (Duncan, 1972; Aldrich & Pfeffer, 1976). This implies that over time an initial fit can become a misfit when environmental demands change and practices do not change accordingly (Gresov, 1989). Such fit-destroying environmental changes should induce project participants to change their practices to bring them in line again with the new environmental demands (Siggelkow, 2001). However, attempts of organizations to restructure practices to regain fit are not always effective (Mintzberg, 1978; Tushman & Romanelli, 1985) so that misfit remains.

In trying to explain misfit, scholars increasingly point to the role of history (e.g., Sydow et al., 2009). If we assume that history at least partially influences current misfit, the path dependence concept

appears a fruitful theoretical starting point (Schreyögg & Sydow, 2011). Applying only a contingency perspective – from which the concept of fit originates – would be of limited value. Contingency theory has been criticized for being inherently static and a-historical, failing to take into account the effects of past organizational behavior on current practices and (mis)fit (Donaldson, 1987; Shenhar & Dvir, 1996). Path dependence explicitly considers imprinting effects of the past on current behavior (Beckman & Burton, 2008). Path dependence is a broad concept indicating that prior organizational actions or behavior closes down possible future paths of actions or behaviors (Jones & Khanna, 2006). Path dependence is related to – but not the same as – other theoretical mechanisms that connect the past and the present and which state that 'history matters' (Nooteboom, 1997), like institutional persistence and structural inertia.[7] Institutions for example have a tendency to evolve incrementally rather than radically, making it more likely that today's practices are very similar to yesterday's practices (Scott, 1995). Institutionalized practices consist of rules and resources that are produced and reproduced over time (Dille & Söderlund, 2011), shaping how organization members perceive the environment and guiding organizational behavior (Phillips, Lawrence, & Hardy, 2000).

Though the concept of path dependence is quoted frequently, its meaning and logic often remain vague and ambiguous (Schreyögg, Sydow, & Holtmann, 2011). To deal with this issue, any theoretical or empirical contribution to the path dependence literature should start

[7] For a more detailed overview of how path dependence differs from other 'history matters' notions, see Vergne and Durand (2010, p. 742)

with a proper definition of the concept (Vergne & Durand, 2010). In order to separate path dependence from other 'history matters' notions, we use a rather narrow definition, one that makes a distinction between the outcome of path dependence (so-called lock-ins) and the mechanism realizing that outcome (self-reinforcement). We define path dependence of practices as a process causing practices to be self-reinforcing, resulting in lock-in in the absence of exogenous shocks (based on Vergne & Durand, 2010). This definition is in line with Sydow and colleagues (2009), who claim that path dependence is first of all a process consisting of three developmental phases. In phase 1 – the Pre-formation phase – the range of practices from which participants can choose is broad. However, at so-called 'critical junctures' (Collier & Collier, 1991), an adopted practice triggers a self-reinforcing process which demarcates the start of phase 2, the Formation phase. In this phase a dominant pattern of practices is likely to emerge, making it increasingly difficult to reverse the initial pattern of practices. During the transition from phase 2 to phase 3 – the lock-in phase – options become even more constrained, leading to a situation in which practices become fixed and gain a deterministic character: lock-in occurs. A lock-in situation is characterized by a state of stability with low incentives for internal change (Vergne & Durand, 2010). In the context of interorganizational projects – because of their complexity and ambiguity – it seems better though to speak of quasi lock-in: a predominant set of practices which leaves some room for further development, but only in a direction commensurate with the self-reinforcement (Sydow et al., 2009). (Quasi) lock-in does not automatically result in inefficiency, but inherently over time practices

are likely to become less efficient in the face of new, more efficient alternatives or changing internal or external demands (Sydow et al., 2009). To speak of quasi lock-in implies that lock-in is not absolute, but rather that one can distinguish between strong and weak lock-in situations.

In order to evaluate whether a misfit between IO project practices and demands really is the consequence of path dependence and subsequent lock-ins, a closer look at the mechanisms leading to lock-in is useful. Sydow and colleagues (2009) introduce four self-reinforcing mechanisms which are at the heart of path dependence: coordination effects, complementarity effects, learning effects, and adaptive expectation effects. Each mechanism, or any combination of the four, can lead to the creation of a path which is increasingly irreversible and eventually leads to a (quasi) lock-in situation. The notion of coordination effects builds on the idea that it pays off to follow routines and adopt practices that are widely shared and used by others. Coordination effects are the consequence of shared rule-guided behaviors. The more actors adopt a specific set of practices, the more efficient interaction between them becomes. Behavior of actors can thus be anticipated and reactions can be considered in advance. Through these benefits of continuous replication, practices are likely to become fixed. Standardized and routine practices enhance efficient coordination when multiple organizations perform interdependent tasks under strong time pressure (Kadefors, 1995). It also shows resemblance with the network effect (Farrell & Klemperer, 2007).

With regard to complementarity effects, interaction between separate but interrelated practices creates synergy (Stieglitz & Heine, 2007). The benefits of repeatedly combining interrelated practices do not simply add up, but create an additional surplus. When practices are interconnected in a way that makes it unattractive to deviate from them, these practices are likely to become fixed (Leonard-Barton, 1995). Sydow (2009) for example shows that organizations in the German TV industry find it difficult to alter the type of programs they produce, because then they would not only have to change their routines but also their relations (which have a stable, permanent character). Another example of the interrelatedness of practices is addressed in the study of Faems, Janssens, Madhok and Van Looy (2008) on the interdependence between contracts and trust in project governance. Coordination and complementarity effects often reinforce learning effects (Sydow et al., 2009).

The notion of learning effects revolves around the tendency of organizations to develop more efficient ways of working when practices are repeated. This makes it less appealing and more costly to switch to other ways of working despite the potential value of doing so. For example, organizations are less likely to turn to new partners if relationships with current partners are successful (Windeler & Sydow, 2001). Again, practices are likely to become fixed.

Finally, adaptive expectation effects can be the result of convergence towards expectations of others (Sydow et al., 2009). From an organizational perspective, while seeking legitimacy, organizational members are more willing to adopt certain practices when they expect others to follow these practices, too. These self-

reinforcing adaptive expectations create self-fulfilling prophecies in organizations. Szulanski (1996) for example shows that organizations, in trying to end up on the winners' side, copy practices because they expect others to do the same.

The theoretical arguments discussed above have been applied mainly to single organizations. In the present study they are applied in an interorganizational project context. When IO project practices do not fit the context in which they take place, project practices are less efficient than when practices and environmental demands do match. But even when organizations experience a mismatch between practices and demands, they may be unwilling or unable to change their practices because of self-reinforcing mechanisms. Following the theoretical arguments discussed above, organizations are less likely to change their project practices if a) practices have become routine among a set of actors and as such enhance the efficiency of collaboration (coordination effect), b) a set of practices is deeply intertwined, making it unattractive to deviate from any single established practice (complementarity effect), c) if – driven by efficiency reasons – the motivation to incrementally improve a given set of practices is higher than the motivation to look for new, radical alternatives (learning effect), leading to sub-optimalization, or d) if actors expect from one another that they collaborate according to well-established practices, and act on the basis of these expectations (adaptive expectation effect). Following this logic, path breaking will require an interruption of these mechanisms and the restoration of choice with regard to alternative practices. All together, from a historical perspective, path dependence and subsequent lock-

ins may explain at least partially misfit between contemporary IO project practices and project demands.

2.4 Methods

2.4.1 Research design and setting

This paper is an in-depth qualitative study that adopts an approach based on the 'Gioia template' (Langley & Abdallah, 2011; Corley & Gioia, 2004). Such an approach is considered useful for exploring relatively uncharted territory like the history of IO project practices in Dutch shipbuilding. A virtue of this type of research is that it explicitly takes into account the possibility that current practices are rooted in history, i.e., are "institutionalized" to the extent that their use is rarely questioned. Although this approach is useful because of its focus on "understanding the changes people are both instigating and dealing with, and how those meanings evolve" (Langley & Abdallah, 2011, p.213), the present paper employs this approach not as emergent as Gioia and colleagues usually apply it. The starting point of this paper is IO project practices and demands which were searched for in advance. The emergent feature of the approach is applied in identifying the path-dependent aspects of the practices in Dutch shipbuilding projects. We elaborate more in this in our data collection and analysis section.

Following Yin (2009) we choose the Dutch shipbuilding industry as a 'revelatory' case that offers the highest potential for gaining a better understanding of the understudied phenomenon of project history. The Dutch shipbuilding industry is deemed 'revelatory' because of its long tradition in interorganizational project-based production, the

high technical and organizational complexity of their projects and the important contextual changes which took place over time in this industry. Interorganizational collaboration in shipbuilding is complex due to, among others, multi-partner involvement and pressures of time and place. We focus on the period 1950 – 2010 because during this period collaboration demands have changed considerably under the influence of increasing competitive pressure from low-cost countries. Besides, focusing on earlier periods would not allow for the use of oral resources. We limited our study of the Dutch shipbuilding industry to the subsectors involved in the improvement program: offshore, navy, ocean shipping, dredging and maritime subcontractors, and excluded yachting, inland shipping, fishing, harbors and aquatic sport.

2.4.2 Data collection and analysis

Our data consists of interviews with active and retired employees of shipyards and their subcontractors. The importance of oral sources to gain a valid understanding of practices is considerable since practices are rarely written down. During the period April – July 2010 fifteen interviews were conducted with respondents who were at that moment actively involved in the Dutch shipbuilding industry and participants in the industry improvement program. These interviews serve as the primary source for providing the picture of current IO project practices in Dutch shipbuilding. During the period July – October 2011 and August – September 2012 nine interviews were conducted with respondents formerly employed in the industry and with a maritime researcher. Together, these twenty-five interviews with employees and former employees of shipyards and their

subcontractors provide information on historical and contemporary IO project practices and demands. They also provide understanding of whether or not IO project practices and demands have changed over time and, in case of change, why and how these changes have taken place. For the interviews with retired shipbuilders we relied on purposeful sampling followed by a snowball technique, asking each informant for his recommendations as to who could best explicate the processes of interest (cf. Corley & Gioia, 2004). Interviews lasted on average 60 minutes and were all audio-recorded and transcribed verbatim. Respondents were or had been employed by both shipyards and subcontracting firms. All interviews were semi-structured and relied on an interview protocol focusing on key events and issues within the Dutch Shipbuilding industry. To minimize respondent bias, during the interviews, we did not impose constructs or theories on respondents as some sort of preferred explanation for understanding their experiences (cf. Gioia, Corley, & Hamilton, p. 3, 2012). Recall bias was at a minimum since most of the retired respondents were still active in some way or another in the current Dutch shipbuilding industry, for example through branch organizations or charity.

We analyze the data using constant comparison (Glaser & Strauss, 1967), which means that the analyzing process begins during and also influences the next stages of data collection. As mentioned before, we follow Corley and Gioia (2004) in their approach of coding. Sporadic differences in coding between the researchers were resolved through discussion. During the execution of the research, we identified initial constructs in the data from our

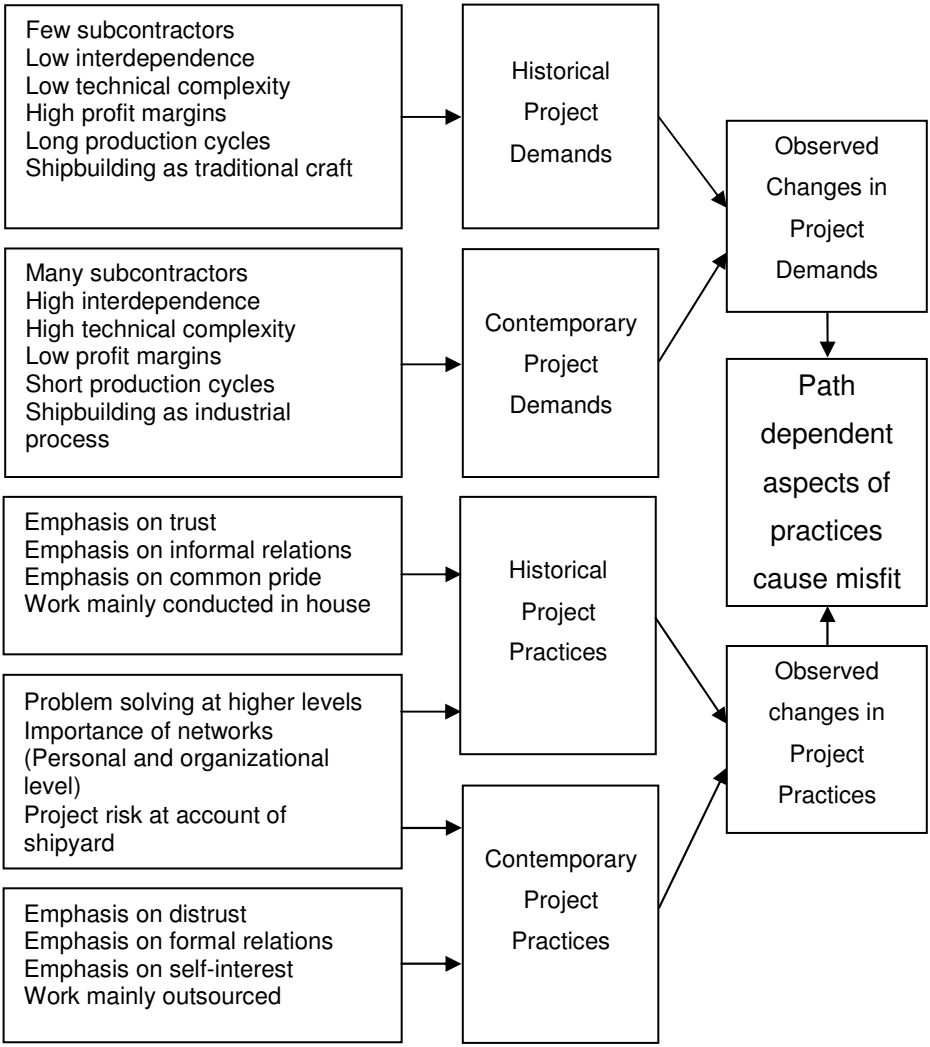
interviews and grouped them together into empirical observations. From this open coding we started to construct second-order themes between these concepts which were historical and contemporary IO project practices and demands. After this categorization into our objects under study, we were able to; firstly, describe how IO project demands in the Dutch shipbuilding have developed in the time period 1950 – 2010. And secondly, take stock of the practices in Dutch shipbuilding that either changed or remained the same over time. The more emergent part of the analysis appeared in our axial coding, which is understood by Gioia et al, (2012) as seeking for connections and divergences among the categories. This step resulted in examining to what extent IO project practices were path-dependent.

We identified IO project practices as path-dependent when, firstly, they were in a misfit with the current set of IO project demands and, secondly, we were able to identify (combinations of) the four self-reinforcing mechanisms described in the theoretical section. The focus on misfitted practices is driven by the notion that inefficiency is a feature of path-dependency (Sydow et al., 2009). Misfit was identified based on the experienced problems and the goals of the maritime improvement program. We searched for the self-reinforcing mechanisms as antecedents of lock-in. As an example, we coded the following quote of a retired shipbuilder about the troublesome improvement in the collaboration with subcontractors as a coordination effect:

> *"That question of who was to blame was hopeless, especially in the traditional discussions. That's what I mean with trouble: accepting the new reality of a role. That's not easy."*

This quote shows that shipyards and subcontractors worked according to certain rules or routines (discussing responsibility for things that had gone wrong) that were fixed to such an extent that it became difficult to switch to other rules or routines. Our final data structure is depicted in figure 2. The process of analysis was iterative in nature until we had a clear understanding of the relationships in our data and further interviews could not provide new insights.

Figure 2. Data structure chapter two



2.5 Findings

In order to describe the developments in IO project practices and demands in the Dutch shipbuilding industry between 1950 and 2010, we first describe changes in both IO project practices and demands by putting their historical and contemporary accounts next to each other. These accounts are based on interviews with respondents both actively and formerly employed in the industry. This is shown in tables 1 and 2. In table 3 we present evidence supporting our interpretations of project practices and demands. Next, we discuss the path-dependent aspects of these IO project practices.

2.5.1 Development of IO project demands in the Dutch shipbuilding industry

In the 1950s and 1960s, the economy of the Netherlands was gradually improving. After WWII, there was a recovery period during which there were plenty of orders for shipyards and high profit margins. The volume and number of ships constructed increased but the technical development lagged behind relative to international standards. One of the retired shipbuilders stated that this was illustrated by the relatively late transition from the traditional riveting of steel plates (a construction method at which two workers hammer both ends of a steel pin until it is rounded) to the general use of welding (the process of amalgamating two steel plates into one by melting the two pieces and adding a filler material). The shipbuilding industry was and is highly sensitive to cyclical economic fluctuations due to its dependence for project orders on shipping companies and ship owners. Both active and retired shipbuilders indicated that this is the case. This market condition does not seem to have changed over

the years. Firms other than the shipyards taking part in projects mostly acted as suppliers ("jobbers") rather than co-makers. In other words, they supplied pre-specified parts or components but they did not perform much work on the ship itself. Consequently, the interdependence between firms was relatively low. However, the present-day situation is characterized by a strong increase in the outsourcing of work to specialized subcontractors due to the fact that vessels have become technologically more complex and knowledge intensive. This results in high interdependence between organizations during the production process. As the retired shipbuilders stated, this was not the case around the period 1950–1970. The type of vessels built at that time had relatively low levels of technical complexity. As a result, there was hardly a need for the shipyard to in-source technical know-how. Many of the retired respondents pointed out that before the 1980s the shipbuilding industry was still seen according to standards of traditional crafts, i.e., tasks were assumed to be executed in terms of craftsmanship and production was a matter of the experience of the craftsman. This long-established environment was described by one of the retired shipbuilders as follows:

> *"We built ships since the start of this era. At the beginning of the seventh century we were the biggest shipbuilder of Europe, maybe in the world. It's a pretty traditional market."*

The ethos of the industry revolved around building ships rather than manufacturing capital goods. This was mainly attributed to market conditions in which the Dutch shipbuilding industry produced

relatively simple, large vessels like tankers and bulk carriers. The production time of ships was relatively long, resulting in low time pressure. Nowadays, shipbuilding is characterized by a modern industrial orientation, i.e. standardization and fine-tuning of the production cycle which is illustrated by the adoption of section-wise construction and the use of computer-aided design. This change in orientation started roughly from the 1980s onwards. Time pressure on project completion increased due to the shortening of production cycles and profit margins decreased under the influence of global competition, which was spurred by the rise of Asian economies like Japan back then and China today. This trend forced the Dutch shipbuilding industry to re-focus on niche markets and direct its efforts to specialization and innovation. In comparison to European competitors, the Dutch shipbuilding industry has been able to maintain its position. However, as described in a British research report, the position of the Dutch shipbuilding industry remained precarious:

> *"The Netherlands nearly lost its shipbuilding industry in the late 1980s but appears to have fully recovered in the 1990s, though it saw a sharp drop-off in sales in 2003. The Dutch market was in 2005 roughly where it was in the late 1970s" (RAND Corporation, 2005).*

Summarizing, we observe a coherent set of IO project demands which have undergone major changes over the past decades. Both organizational and technological complexity of IO projects have increased because of an increase in the number of project partners

involved and the interdependency among them, technological developments and more intense time pressure on the production of vessels. Because of these factors, which are amplified by a decrease in profit margins and a continuous sensitivity of the sector to economic fluctuations, the current Dutch shipbuilding industry can be characterized as a versatile and dynamic environment. An overview of these historical and contemporary project demands is summarized in table two.

Table 2. Overview of IO project demands

Historical demands	Contemporary demands
Few partners involved in a project	Many partners involved in a project
Low interdependence (Subcontractors only supplying components)	High interdependence (Subcontractors installing components on board)
Low technical complexity of vessels	High technical complexity of vessels
Low time pressure, long production cycles	High time pressure, short production cycles
High profit margins	Low profit margins
Industrial orientation similar to traditional craft of constructing vessel	Industrial orientation similar to producing modern maritime product
Sensitivity to economic fluctuations	Sensitivity to economic fluctuations

2.5.2 Development of IO project practices in the Dutch shipbuilding industry

During the second half of the twentieth century shipyards performed most of the work in-house. As a result, there was less urgency to coordinate and monitor other firms. One of the retired shipbuilders illustrated this situation as follows:

> *"We employed everyone, our own painters, scaffold builders, and ship carpenters. (…) We outsourced very little."*

Shipyards tended to conduct most of the project work in-house and there was a high communal pride in the work. In addition to this, whenever problems in the project appeared, for example with quality, delivery times or budget, these were solved at a higher management level. One of the retired shipbuilders explained why:

> *"It could be that the project manager had a row with the project manager of the subcontractor, for example, because he lagged behind on delivery times or quality. But because sooner or later you had to deal with each other again, the board of directors had to make sure the conflict didn't get out of hand."*

Over time, the outsourcing of project work to subcontractors has increased significantly as a response to shorter production cycles, increased time pressure, and greater technical complexity. The increased outsourcing was driven by the need for cost reduction caused by the project demand of price competition on the global

shipbuilding market. However, while outsourcing more and more work, the shipyards have clung to their orchestrating role in the process. This may have led to the formal and low trust nature of their current relations with subcontractors, as illustrated in the following quote:

> *"Those alleged reliable partners of ours had the market so nailed up that every attempt to involve third parties was nipped in the bud. That's where we pay extra. They just paid them [the "third parties"] to either not tender or just above their offer. They received a fee for that which was then on-charged to us."*
> *– Purchasing manager Shipyard*

The shipyards have always been and still are the central actors in a project. They coordinate and monitor the activities of subcontractors, communicate exclusively with the end customer, and also bear most of the risk on the project. It is this unbalanced risk-taking that is the major source of problems between shipyards and subcontractors, as put by one of the retired shipbuilders:

> *"When the yard's project manager and the subcontractor's project manager share the responsibility, you can get improvement. But that discussion never came to a good end. Nobody wanted to make concessions. Then it stops. As long as responsibility resides with one party, that party will take the decisions. Because he is responsible for profit and loss."*

Early in the second half of the twentieth century, IO project practices in the Dutch shipbuilding were characterized by flexible contract application and by relations primarily based on trust. This was also noted by a maritime researcher:

> *"They saw each other often in the church on Sunday. Trust developed there. The contract is a document, you need to have it, but it is only for emergencies. You do not use it in every-day practice."*

However, this changed notably over time because, for example, having more subcontractors impeded the development of personal relationships with everyone. Nowadays, contracts are more detailed and broader in scope. Shipyards and subcontractors nowadays tend to write extensive and elaborated contracts and apply them in a rigid manner.

Another finding is the decay of the common pride that formerly characterized the Dutch shipbuilding industry. Some of the contemporary actors expressed enduring pride in their work which is mainly displayed in an attitude in which the overall project success takes pride of place. Others however emphasize self-interest, either financial or otherwise, even if at the expense of the project. Pursuing one's self-interest is illustrated by the following quote:

> *"People are more and more looking up their own alley. This part is finished within the allocated hours so I am done with it. If I have to step it up to make it more efficient somewhere else,*

I will put in more hours and I am evaluated by that so I rather don't." – Technical manager Shipbuilding

Notwithstanding the practice of prioritizing one's self-interest, there is a strong emphasis on informal personal and organizational networks in which participants involved in the IO project enhance their communications, direct their efforts and observe their attitudes. This IO project practice of operating through informal personal and organizational networks does not seem to have changed over time. In current shipbuilding projects that *do* operate in a flexible and informal way, respondents indicate that the pleasant and successful collaboration is a consequence of the long-lasting relationships between yards and suppliers. However, this is no longer a widespread practice in the industry.

Summarizing, we observe that some practices have changed during the past five decades whereas other practices remained relatively stable. IO project practices have shifted from a more informal way of organizing work and coordinating relations to a more formal manner of collaboration, with a stronger emphasis on contracts. In addition to this, shipyards now outsource significantly more of the work to subcontractors.

Examples of practices that have remained more or less the same over the past decades are the central role of the shipyard, the skewed financial responsibility for projects, the importance of informal networks, and referral of problems to higher hierarchical levels. An overview of these historical and contemporary project practices is summarized in table three.

Table 3. Overview of IO project practices

Historical practices	Contemporary practices
Trust-based coordinating	Less trust-based coordinating
Emphasizing informal contracting	Emphasizing formal contracting
Emphasizing common pride	Emphasizing (financial) self-interest by some participants, lasting pride by other participants.
Shipyard acting as lead organization	Shipyard acting as lead organization
Shipyard conducts most of the work in-house (work distribution shipyard – subcontractor: 70-30)	Shipyard outsources much of the work (work distribution shipyard – subcontractor: 30-70)
Operating through informal networks (personal and organizational level)	Operating through informal networks (personal and organizational level)
No risk sharing, financial responsibility at the shipyard	No risk sharing, financial responsibility at the shipyard
Problems referred to higher hierarchical levels	Problems referred to higher hierarchical levels

Although IO project practices have changed to some extent, these changes did not always increase the fit with the changing demands set by the task environment. Furthermore, there are also practices that remained the same over the period of 1950–2010; either causing a misfit or allowing an already existing misfit to continue.

Based on practices considered appropriate by the project participants in the improvement program mentioned earlier in the paper, we consider four contemporary practices to be at a misfit with the current set of IO project demands. First, the complete financial responsibility at the account of the shipyard, which remained the same over time, does not fit with the current project demands of higher interdependence between project participants and lower profit margins in the Dutch shipbuilding industry. The current set of IO project demands calls for a more shared risk distribution or, in the words of one of the respondents in this study:

> *"The more product complexity increases, and the available time decreases, the more you have to move towards collaboration in which risks are shared. The same goes for financial risks. That is a learning process for both parties. It also means there has to be trust, you let them look behind the scenes, and people have to dare. And I have to admit it is laborious." – Commercial Director Shipyard*

In addition to this, the goal of the improvement program of increased knowledge sharing in IO projects is unlikely to be achieved when financial responsibility resides with one party. Second, the shipyard's role as lead organization in the IO project, which remained the same over time, does not fit with the increased number of partners involved in a project and the higher technical complexity of vessels. These contemporary demands make it difficult for one single firm to coordinate the entire project and bring together all the required

technical know-how. This is formulated by the program director of the maritime improvement program as follows:

> *"We used to know that a guy was pulling cables on a project but we didn't know exactly how he was doing besides his remark: 'it is going okay'. When you know that better you can take better decisions."*

Third, the stronger emphasis on self-interest, which increased over time at the expense of the common pride in shipbuilding projects, is at a misfit with the increased competitive pressure from Asia, in combination with the modern industrial orientation on producing turn-key maritime products appropriate for the complex products in which the Dutch shipbuilding now specializes. These demands necessitate a holistic project-oriented attitude of all partners involved in order to achieve the goal of a stronger competitive position of the Dutch shipbuilding industry. One of the respondents stated:

> *"I used to check all the drawings but eventually I thought: this is not my job, I don't get paid for this. So now we use more materials, it increases the cost price"*

Shipbuilding projects can benefit from participants that align their self-interest more with the broader interorganizational project than their organization-wide interest. Finally, the stronger reliance on formal contracting is assumed to be at a misfit with the demands of higher time pressure and shorter production cycles in shipbuilding projects. More formalized contracting makes it difficult to quickly

react to changing project conditions and efficiently deal with the increased time pressure and shorter production cycles. One of the retired employees in our study formulated the problematic nature of this practice as follows:

> *"Currently, I see how lawyers get bogged down in contracts, that they are nitpicking each other. That is nothing but distraction from the real goal: to build a ship together."*

Table 4. Data supporting interpretations of IO project practices and demands

Data supporting interpretations of project practices and demands	
Theme	**Representative quotes**
	Changes in IO project demands
Historical project demands	Low interdependence / Few partners involved in the project: "The most important thing is that in that time the yard wanted to do everything on its own. They had their own painting companies, own electrical division. They controlled everything by themselves." (-retired shipbuilder) (Positive) Economic sensitivity / Long production cycles: "And my boss said to me 'there's a bunch of papers, good luck'. Those were all specifications for ships. In that period economy was doing so well that shipping companies stood in line for shipyards. We simply couldn't find the time to handle all the customer requests." (-retired shipbuilder) (Negative) Economic sensitivity: "In times of

	economic decline, one had to fire employees on a large scale to keep one's head above water." (-Government report on Dutch maritime industry)
Contemporary project demands	High time pressure: "The pressure of work is quite high. You've got a time-limit that is just very tight. We work with schedules from which you know beforehand: well, I hope we're going to make that." (-Technical manager, Shipyard) High interdependence / High technical complexity: "Who is designing something? Who is delivering something? Who is connecting it? Who is commissioning it? And it was very clear from the start so every time we had a discussion, we just opened the demarcation: no, it is yours. You have to sort it out. And it saved a lot of discussions. (-Project manager, electrical company) Many external partners involved: "Subcontractors became more and more important because the entire functioning of the vessel is dependent on the performance and quality of the subparts. So their importance and influence with regard to profit and risk grew immensely." (-maritime researcher)
	Changes in IO project practices
Historical project practices	Trust-based coordinating / Operating through informal networks: "There was only one supplier, for electrical installations, that was important. That

	is called subcontractor right? I don't believe he cheated us. We had a very good relationship with him." (-Retired shipbuilder) Emphasis on common pride: "It [shipbuilding] used to be much more goal-driven. Everybody was glowing with pride at the moment a ship sailed away for the first time. It has changed from a shared, common pride of that ship sailing away to how can I write my contracts in such a way that it is to my own advantage. It all has become less open. " (-Retired shipbuilder) Operating through informal networks / Problems referred to higher hierarchical levels: "Whenever the board of directors of site X came over to talk to the board of directors of site Y, they always dropped by at our department and said: you guys work together, we'll do the fighting at the top. You maintained good relations with those guys." (-Retired shipbuilder) "I think that between yard and subcontractor there were always informal arrangements, it's always a matter of give and take. That one [project manager] says 'ok, if you do this task for me then I won't bother you about that thing'. It's often the most efficient way to get a result." (-Retired shipbuilder) Emphasizing informal contracting: "The rivalry

	between the Dutch shipbuilders in those days was legendary. In the eyes of outsiders they were bitter rivals. Behind the written contrasts institutionalized cooperation was hidden." (-de Voogd, 1993)
Contemporary project practices	Emphasis on (financial) self-interest: "Everyone is fighting for his own purse. And that is not unhealthy, I think. But the atmosphere is quite different. Because the atmosphere is no longer about how we are going to solve it but more about: if you want me to do something it will cost you." (-Head project management, electrical company) Shipyard acting as lead organization / Less trust-based coordinating: "We are seen as the troublesome subcontractor, who tries to keep things covert, something we have to do because as soon as we tell something they take it to the competitor, and then we are left empty-handed. That just happens. Drawings are copied and given to the neighbors. What is your price? (…) Then you don't put everything on drawing." (-Contract manager, electrical company) Emphasizing formal contracting / Emphasis on (financial) self-interest: "It is much easier if you can arrange things on the production floor, much and much easier. But today that is no longer possible. Today everything needs to be confirmed by email

	and backed up with pictures. That is really a trend that has become visible over the past few years. You can make informal arrangements with a person but it can have major consequences when these commitments are not met. Because when the work is not done, it costs us time and money." (- Production manager, painting company) Shipyard acting as lead organization / degree of outsourcing / Emphasis on formal contracting: "The contracts between shipyard and subcontractor go pretty far, because they spell out in detail a subcontractor's functionality and supply scope, but also a demarcation list with activities. And they do that for every subcontractor. And the structure of the contract and the purchasing conditions are written down in such a way that you as a subcontractor have no say in the overall picture. The shipyard outsources 70% of the entire vessel to subcontractors, but these subcontractors have no influence on the building process. (…) No matter for what reason, if there are problems with the planning that cause you to start your work later, can deliver later, and hence need to put more time and effort in your job, you cannot call the shipyard to account for that extra time and effort." (-Head project management, electrical company)

2.5.3 Self-reinforcing mechanisms in IO project practices

We will assume path dependence only to be probable when there is a misfit between current IO project practices and project demands. This is in line with the assumption that path dependence inherently leads to inefficiency, or sub-optimalization. In the preceding text we have identified a current misfit between IO project demands and the following IO project practices: a) the shipyard bears the major risks and full responsibility towards the end customer for delivering the vessel on time and according to specifications; b) the shipyard acts as the lead organization; c) shipyards and subcontractors pursue predominantly their own (financial) interests; and d) shipyards and subcontractors contract in a formal, rigid way. While the former two practices have remained stable over the past 60 years, the latter two have changed substantially during this period.

The criterion we use to identify practices as actually being path dependent is whether one of the self reinforcing mechanisms, or a combination of these mechanisms, has plausibly influenced the development or stagnation of project practices. We distinguish between two possibilities: a) we observe a change in project practices over time which is not in line with the evolution of project demands, or b) we see stagnation of a project practice in spite of a lack of fit with historical and/or contemporary project demands. In the first instance we see the development to the situation of lock-in, in the second case the lock-in was already present.

If we consider the first ineffective practice (shipyard bearing full risk and responsibility), our findings indicate that project demands have

changed over time while this practice has not changed accordingly. In a situation where subcontractors represent about 70% of the total costs of producing a vessel, it seems justified for subcontractors to bear at least part of the risk and responsibility. However, the current practice can be understood from a path dependence point of view. Because the shipyard has always carried full financial responsibility it has learned to take on that role efficiently. If subcontractors would take a share in that responsibility, they would have to develop new skills (e.g., communication and negotiation with the end customer, monitoring the actions and efforts of other subcontractors, skills related to funding the project and dealing with financial risks) in order to carry out that new role:

> *"In the pricing of the project you have to take into account that things can go wrong. […] The subcontractor is not used to that; yeah, their own small responsibility but never as part of the bigger process." – Retired shipbuilder*

Shipyards and subcontractors have learned to play their own specific role efficiently, and changing these roles would require non-trivial adaptation problems. This suggests that both coordination and learning effects are at work in causing this practice to be persistent over time. Because the practice has remained stable over the past 60 years, reinforcement has continued over a long time period, resulting in a strong lock-in which is difficult to break.

Another, related, IO project practice that has not changed over time is the shipyard acting as the lead organization. This practice can be

interpreted as reinforcing due to coordination and learning effects on the one hand and adaptive expectation effects on the other hand. The coordination and learning effect reside in the division of roles in which the shipyard acts as the leading organization, a constellation of roles that is perceived by both shipyards and subcontractors as normal and efficient. Because the shipyard is the leading party during every project, they have mastered a certain efficiency and standardization regarding the coordination of collaboration. Similarly, subcontractors have become proficient in their role of being responsible for their specific contribution. The adaptive expectation effect lies in the persistent division of roles due to which project participants expect this same division of roles to occur in new projects. A subcontractor participating in a new project would automatically assume the shipyard to be in the lead, mainly because other parties also do so. Again – similar to the practice of the shipyard bearing full risk and responsibility – this practice has reinforced itself over a long time period and has become strongly institutionalized:

> *"The discussion of the subcontractors becoming more central started somewhere in '85. Whenever the subject was discussed everyone backed out at the end of the day and said: No, let's stick to the old way." – Retired shipbuilder*

The combination of the shipyard bearing all the risk and financial responsibility and acting as lead organization constitutes a complementarity effect: the interrelatedness of these practices makes it problematic to deviate from either one. For parties that bear

financial risk, it seems logical to take on a leading role, as the retired shipbuilders pointed out. A subcontractor may feel no urgency to become more central if he has no financial responsibility, and may be reluctant to take responsibility if not given the central power and authority to manage the collaboration process. Due to this complementarity effect, this set of practices has become fixed. While each practice on its own is self-reinforcing, the interrelatedness of the practices strengthens these self-reinforcing effects, resulting in a very strong lock-in.

Next we discuss the two practices that have changed over time and which we consider ineffective given the current project demands. The current trend that both shipyards and subcontractors mainly pursue their own interests intuitively conflicts with the current demand stemming from the organizations' increasing mutual dependency. Comparing this present-day situation with the situation a few decades ago, it appears that in the old situation the range of options was broader than in the current situation. While earlier shipyards and subcontractors could choose between pursuing self-interest on the one hand and working for a common cause on the other hand, the current situation seems to predispose them to neglect the greater cause and pursue first and foremost their (financial) self-interest. Our results indicate that this process is at least partially triggered by adaptive expectations. Because of the involvement of multiple, legally independent organizations – that implicitly or explicitly have separate and conflicting financial interests – the common expectation has become that organizations will give priority to protecting these interests. When organizations expect their

partners to act in a self-interest seeking manner, they are more likely to display the same behavior, which will be observed by the others, thus creating a self-fulfilling prophecy. This vicious circle leads to a situation where behaving opportunistically is considered the only appropriate course of action, so that lock-in occurs:

> *"A shipyard that accepts a price for a vessel, that's often under pressure, will try to get that money back from the subcontractors. Well, that's contrary to the idea of co-makership, which is the motto. That was a hundred years ago a problem, it was fifty years ago a problem and it's still a problem." – Retired shipbuilder*

> *"That guy [shipyard employee] has been molded that way over twenty, thirty years. You cannot change him anymore, that's a non-starter. He has been trained to exploit subcontractors, and that is what he will be doing for the rest of his career." – Subcontractor*

Related to this IO project practice is the practice of formal contracting. While earlier interaction between shipyards and subcontractors was of a more informal nature, the current situation is characterized by more formal ways of interaction, including formal contracting. Our interviews indicate that this practice has co-evolved with the practice of pursuing self-interest. If organizations expect others to behave opportunistically, they will try to safeguard their own interests. This can be accomplished by writing extensive, detailed contracts in which roles and responsibilities of each partner are

made explicit. The interrelatedness of these two practices suggests that complementarity effects play a role in reinforcing a process in which options have narrowed down, eventually leading to a lock-in situation. This lock-in situation is characterized by organizations pursuing mainly self-interests, and relying on formal contracting to safeguard against opportunistic partner behavior.

> *"Practice has changed from having a common goal towards crafting contracts with hidden meanings which I can use to my own advantage." – Retired shipbuilder*

In sum, our results suggest that the current misfitted practices can at least partially be explained by path-dependent processes. Shipyards bear full risk and responsibility and act as lead organization because over time they have learned to perform this task efficiently, which fosters coordination of and communication between shipyards and subcontractors during the process of building complex vessels. Shifting responsibility towards subcontractors would require substantial investments to master new, unfamiliar skills both on the account of the shipyards and the subcontractors. Shipyards and subcontractors pursue self-interest and rely on formal contracting because they believe that the others follow this strategy as well, creating a vicious circle in which these practices reinforce one another to the point that other options are considered inefficient.

2.6 Conclusion and discussion

The starting point of this paper is the acknowledgement by industry actors in Dutch shipbuilding that contemporary IO project practices do not fit contemporary IO project demands. In this paper we have explored path-dependent explanations for this misfit. Focusing on the practices that do not fit contemporary demands, we have identified continuity in some practices and change in others. Both persistent and changed practices seem to be influenced by combinations of self-reinforcing mechanisms. All in all, our analysis suggests that the misfit has at least partially been shaped by historical developments.

To understand the misfit between demands and practices in Dutch shipbuilding projects, we complemented contingency theory with the path dependence perspective to avoid the static and a-historical stance of the former theory. In doing so, we advance the field in several ways. First, we empirically identify theoretically proposed mechanisms (Sydow et al., 2009) which trigger path dependence. Most empirical research on path dependence tends to examine path dependence in the sense of 'history matters' only, without entering into details on self-reinforcing mechanisms (Vergne & Durand, 2010). Our findings suggest that indeed the proposed mechanisms play a significant role in explaining lock-in situations and subsequent misfit in an IO project context. In addition, we suggest a refinement of the proposed mechanisms by taking into account that the mechanisms operate not in isolation but in an interrelated manner. It seems precisely to be this interrelatedness between path dependence mechanisms that makes misfit so difficult to remedy in the Dutch shipbuilding industry. Thus, similar to interrelated

practices, interrelated mechanisms form a configuration which creates complementarity effects. Second, our study demonstrates that path dependence can lead to incremental or creeping change. As we have shown, some IO project practices have changed over time in a direction counter to what one would expect given the contemporary environmental demands. During this process, the availability of alternative practices has decreased, ultimately leading to a lock-in situation. This process – which we label path-dependent adaptation – is counter to contingency theory's assumption that organizations change their practices on short notice to bring them in line with changing environmental demands. So while contingency theory assumes organizations to change practices to regain fit, path dependence helps explain why organizations sometimes change their practices 'in the wrong direction', thereby creating or sustaining misfit. Third, we extend path dependence literature by applying its insights to the context of IO projects. Most research on path dependence pertains to organizations rather than goal-directed networks of organizations, but we show that insights on path dependence can be generalized to this context as well. Our fourth and final contribution is a critical note on path dependence models that describe path dependence as a three-stage process (e.g., Sydow et al., 2009, p. 692). Such models may be less suited to explain situations of early lock-ins. Some IO project practices in Dutch shipbuilding have remained unaltered over time, suggesting that the available range of alternative practices has been limited since the beginning. This seems to call into question the idea of 'critical junctures', the moments at which practices become subject to self-reinforcing mechanisms. Though these models aid in explaining

why these practices have not changed over time, they fail to explain how early lock-in situations are reached. Explanations other than path dependency may be needed here.

2.7 Implications and directions for future research

Based on our findings we suggest two practical implications for project managers, in specific change agents (e.g., Seo & Creed, 2002), seeking to change practices. First, they should be well aware of historical influences on contemporary practices. Historical influences hamper their ability to break away from these practices because they follow a more or less pre-determined path. To change these practices would require path breaking. The idea of path breaking however is somewhat self-contradictory since path dependence is a process in which organizations or industries face difficulties in changing their practices successfully. A minimum condition would be the development of alternative practices, and the interruption of the discussed self-reinforcing mechanisms. An approach to deliberately break paths might be critically reflection on taken-for-granted practices, for example via assumption surfacing (Kettinger, Teng, & Guha, 1997). On top of that change agents should consider the development of superior alternative practices (cf. Arthur, 1994). Second, change agents should be aware of the interrelatedness of practices as well as of the path-dependence mechanisms underlying their persistence. Interrelatedness of practices implies that one cannot change one practice without influencing the other. To successfully change practices then requires a configurational or holistic approach (e.g., Clarke, 1999). Such an

approach would consider the complexity and interrelatedness of practices and develop initiatives aimed at changing sets of practices rather than single ones. Interrelatedness of path-dependence mechanisms implies that multiple causes for a lack of adaptation to project demands must be addressed simultaneously. For instance, to change the practice of the shipyard bearing all the risk in a project, the suppliers involved should learn to master this role, but the mutual tacit assumptions concerning the roles of shipyard and suppliers should also be addressed. The difficulty to achieve all these changes simultaneously may well explain why improvement initiatives like the one mentioned in the introduction to this paper have a high risk of failure.

There are some limitations to our study which suggest opportunities for future research. The most salient limitation is of a methodological nature. In trying to discover path-dependent explanations for the current misfit, we have relied on subjective, oral sources. This method makes it difficult to objectively establish if the current misfit is indeed the result of path dependence, and to ascertain which situations qualify as lock-ins. In response to this issue experimental studies as proposed by Vergne and Durand (2010) could be performed, but these would in turn be limited in their ability to incorporate historical aspects, especially at the industry level, like in the shipbuilding sector that formed the context of our study. A related issue concerns our single-method approach, which limits the possibility to triangulate data. The use of documents and archival data could provide additional insights. As IO project practices, especially informal ones, are rarely written down such an archival

approach in our view should be combined with oral history. Another limitation concerns respondents' recall bias, to the extent that they may better recall positive events than negative ones, creating an inaccurate picture of historical practices and demands and their development. However, respondents did not give the impression to believe that everything was better in the old days, and in some cases concluded that the current problems are no different from the problems 60 years ago. In addition, many of the retired shipbuilders we interviewed are still active in industry associations, enabling them to reflect on both historical and contemporary practices and demands. Considering these various limitations, future research could benefit from developing more objective measures of the self-reinforcing mechanisms, and from applying a multi-method approach combining the use of documents, archives, and statistical analysis.

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Chapter 3

Collaborative Routines in Interorganizational Projects

3.1 Introduction

The concept of organizational routines, defined as "repetitive patterns of interdependent organizational actions" (Parmigiani & Howard-Grenville, p. 414, 2011) has been extensively studied in the past decades. Routines are considered central in explaining organizational and economic change (Becker, 2004). Although the earliest studies on routines date back to the 1940's and 50's, one of the most seminal works on routines has been Nelson and Winter's book, *An Evolutionary Theory of Economic Change* (1982), which has been cited by others over 24,000 times. Nelson and Winter mention both routines and capabilities in their book, defining routines as "regular and predictable behavior patterns of firms" (Nelson & Winter, p. 14, 1982) and capabilities as "the range of things a firm can do at any time" (Nelson & Winter, p. 52, 1982).

Organizational routines are studied through the perspectives of capabilities and practices, based in economics and sociology, respectively, with the former focusing on the 'what' and the latter on the 'how' of routines (Parmigiani & Howard-Grenville, 2011). In a nutshell, the capabilities perspective views organizational routines as a 'black box', and focuses on explaining both the drivers of these routines and their effect on organizational performance. The practice perspective, in contrast, aims to open the black box, and looks at different aspects of routines, their development and internal dynamics.

For example, Gilbert (2005), in his study on newspapers, differentiated between resource and routine rigidity associated with responding to digital media. He did so from a capabilities perspective, focusing on the role of routines in providing newspapers

with a competitive advantage and studying the different drivers for resource and routine rigidity. A contrasting example is Feldman's (2000) study on routines of university offices in housing students. She assumed routine stability but found that routines hold potential for change through individuals altering their performance of routines when desired outcomes are not met. Her study showed the practice perspective through its focus on the internal workings of routines and the agency of the actors involved. Note that these studies on routines are focused on the intra-organizational level.

However, interorganizational collaboration among different actors in projects has become a wide-spread mode of organizing in different industries (Jones & Lichtenstein, 2008). The pervasiveness of the interorganizational project form in the modern economy cannot be denied (Grabher, 2002b; Kenis, Janowicz-Panjaitan & Cambré, 2009). Following Jones and Lichtenstein (2008), we henceforth refer to interorganizational projects as IO-projects, while adopting the more elaborated definition from Bakker et al. (2011, p. 783): "temporary interorganizational systems of legally autonomous but functionally interdependent firms that interact to coordinate their efforts for the accomplishment of a joint service or product in a limited amount of time". At first sight there seems to be little opportunity for routines to develop in this type of setting because ideal typically IO projects are temporary (Jones & Lichtenstein, 2008), meaning that the project disbands upon task completion, often after a short life span. This short life span restricts the evolution of informal social interaction, that make up mutual adjustment as coordinating mechanism (Mintzberg, 1980) increasing the need for more deliberate forms of coordination (Raab et al., 2009). Even

more, organizations participating in the IO-project have to interact closely in order to accomplish often complex and interdependent tasks (Hobday, 2000). If we assume IO-projects to be isolated and unique, as is the case in the more traditional project management view, the question arises how participating organizations that are legally autonomous but functionally interdependent coordinate their interactions in the IO-project in order to accomplish a complex task in a limited amount of time and with limited resources.

However, the majority of IO projects have been shown empirically to be relatively strongly embedded in networks of repeating relationships (Bakker et al., 2011; Engwall, 2003), contradicting the more traditional project management view of IO projects as isolated and unique. Logically, the emergence of coordination routines is more likely to occur in such repetitive interorganizational settings because the same or different types of tasks are repeated by the same set of actors (cf. Grabher, 2002). This repetitive and embedded nature of IO projects allows project participants to learn about each other's roles, procedures and ways of interacting in projects, which will facilitate the coordination of their joint efforts.

So, IO-projects often are not single and unique endeavors through the repetition of ties or through the repetition of activities or both, and this allow for the emergence of IO coordination routines (Brady & Davies, 2004). These IO coordination routines hold key potential in explaining both stability and change in TO-based industries, through their coordinating function for individual and organizational action (cf. the work of Kadefors (1995) on the institutionalization of the Swedish construction industry). Interorganizational routines bring stability in these contexts, because they allow firms to effectively coordinate

new projects in ways that have become habitual. But focusing on interorganizational routines may also help understand how coordination in these contexts may evolve over time, as routines, far from being static, inherently carry the seeds of change.

Yet, although we may surmise that coordination routines arise in such IO-project settings and are potentially important, we lack a systematic insight in how they develop. Although interorganizational project performance and learning from and between projects has attracted considerable scholarly attention, the concept of interorganizational routines so far has not (Schussler, Wessel & Gersch, 2012). Furthermore, to date the scarce literature on IO-routines fails to satisfactory explain routine emergence.

First, there is a strong focus on inter-organizational knowledge transfer and learning routines (Dyer & Singh, 1998; Dyer & Hatch, 2006) neglecting other types of routines occurring across organizational boundaries (Mante & Sydow, 2007), such as coordination routines. This skewed focus on IO knowledge transfer and learning routines consequently provides a one-sided view predominantly based on the capabilities perspective. Second, empirical studies on IO-routines are mainly concerned with dyadic interfirm settings, especially strategic alliances (Zollo, Reuer & Singh, 2002; Mante & Sydow, 2007). However, interorganizational relationships entail more diverse settings then the dyadic ones often studied by the alliance literature (Schilling, 2009). For example, Gulati and Singh (1998) showed that a significant proportion of alliances are in fact multilateral alliances, meaning that these include more than two participating organizations. These multi-organizational endeavors are considered essentially different from their dyadic

counterparts due to social exchanges becoming generalized, i.e., there can be an imbalance in exchanges between any two partners, as long as there is an overall balance (Das & Teng, 2002).

This paper theoretically explores how coordination routines can emerge in interorganizational projects. By building on theoretical insights from the capabilities and the practice perspectives and systematically relating these to the interorganizational project dimensions of time, team, task and context, a more thorough and deeper understanding on the emergence of coordination routines in IO-projects can be accomplished, which is the research goal of this paper.

We proceed as follows: first, we show how interorganizational routines are different from their intraorganizational counterparts by comparing and analyzing reviews on the extensive intraorganizational routine literature with key papers from the emerging interorganizational routine literature. Second, we explore the emergence of IO coordination routines by relating them to the project dimensions of time, team, task and context. The paper ends with a discussion on how rigidity and learning issues might play out regarding IO coordination routines.

3.2 Taking stock: Intra- and Interorganizational routines

Much of the work on organizational routines is based on the work of Nelson and Winter; however this literature is flawed by ambiguities (Cohen, 2007; Hodgson, 2008). For instance, the terms capability, routine and practice are every so often used interchangeably (even in the book by Nelson and Winter). The ambiguity in the

organizational routine literature also can be clearly seen in the different perspectives on routines, grounded in economics and sociology, labeled respectively the capabilities and practice perspectives[8] (Parmigiani & Howard-Grenville, 2011). Becker (2004), in his thorough literature review, identified three main causes for the ambiguity in the routine literature. First, the distinction between individual and collective recurrent action patterns is not always specified, leading to debates on habits versus routines. Second, the question whether routines refer to cognition or behavior, which, for example, is in the practice perspective more stressed towards behavior while the capabilities perspective sometimes incorporates cognition into the notion of routines. Third, there is the issue of agency in performing routines. The capabilities perspective assumes bounded rationality of individual actors and routines are performed as expected or designed while the practice perspective sees agency as the key underlying routine change and human action as "effortful" (Parmigiani & Howard-Grenville, 2011). Notwithstanding these ambiguities, it should be noted that routines relate to a multitude of disciplines and topics which make the literature understandably diverse (Pentland, 2011).

So what are routines? Following Parmigiani and Howard-Grenville (2011) we define routines as "repetitive patterns of interdependent organizational actions" (p. 414) but as we show, the understanding of

[8] Although we deem the classification of Parmigiani and Howard-Grenville (2011) appropriate for indicating differences in the routine literature, different classifications exist. For example, Feldman and Pentland (2008) refer to these perspectives as "dynamic capabilities" and "routine dynamics" whereas Becker (2004) in his review on organizational routines identifies behavioral and cognitive regularities as two main interpretations in the extant literature.

what these ‘patterns’ or ‘actions’ are differs significantly whether viewed from the capabilities or the practice perspective.

3.2.1 Capability perspective

The capabilities perspective is rooted in economics and assumes that agents perform routines acting out of self-interest and are characterized by bounded rationality. It focuses primarily on the organizational level and on the effect of routines on organizational performance. Routines, from a capabilities perspective, are defined as “the building blocks of capabilities, with a repetitive and context-dependent nature” (Dosi, Faillo, & Marengo, 2008, p. 1167). With the “context-dependent nature”, the capabilities perspective indicates the organizational specificity of routines which points out one of the main interest of the capabilities perspective: how routines, via firm-specific capabilities contribute to competitive advantage.

Parmigiani and Howard-Grenville (2011) identified three streams of work in the capabilities perspective which show its core assumptions: routines as micro-foundations for capabilities, routines as ‘genes’ promoting stability and inertia, and routines as repositories for knowledge. The two latter streams of work are basically expansions of the first one, displaying different views on the underpinning role of routines for organizational capabilities. The first stream of research studies routines as constituting capabilities. Routines are seen as micro foundations for capabilities, i.e. together they constitute a competence specific to the organization. Capabilities can be divided into ‘regular’ capabilities and dynamic capabilities (Parmigiani & Howard-Grenville, 2011; Helfat et al., 2007; Winter, 2003). The first type relates to combinations of firm-specific routines and the second

type to the capability to create and change combinations of the underpinning routines. Winter (2003) refers to dynamic capabilities as 'meta-routines', which are defined by Zollo and Winter (2002) as a: "learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness" (p. 340). This stream of research shows how the capabilities perspective assumes complementarities between routines and organizational intentionality in designing and structuring routines into capabilities (Parmigiani & Howard-Grenville, 2011).

The two other streams of research in the capability perspective acknowledge this distinction between types of capabilities, but in addition view routines respectively as 'genes' or as 'repositories' (Parmigiani & Howard-Grenville, 2011). First, the stream of literature on routines as 'genes' builds on the ideas proposed by Nelson and Winter (1982) to incorporate the concept of routines into an evolutionary economics framework, explaining the replication of routines through variation, selection and retention (Nelson & Winter, 1982; Winter, 2003; Becker, 2004). This stream of research shows how the capabilities perspective assumes routines to be organization- and situation-specific, affecting the replication or transfer of routines. It also shows the focus of the capabilities perspective on how routines lead to differences in organizational performance.

Second, the stream on routines as repositories of knowledge has stressed the importance of dynamic capabilities for learning due to its focus on change and creation. This stream of literature is probably the largest within the capability perspective due to its connection with

the organizational learning literature and the importance of routines for the more difficult transfer of 'sticky' organizational knowledge (Szulanski, 1996). For example, Kogut and Zander (1992) argue that organizational routines are fitted for the transfer of tacit knowledge, which these authors deem a dynamic capability, since tacit knowledge is harder to codify and therefore can better be transferred via routines which store this type of knowledge into action patterns. This stream of research shows the attention of the capabilities perspective to the degree to which routines are transferable and the role of routines in creating value.

In sum, the capabilities perspective focuses on the role of routines for organizational performance and stresses the importance of routine motivations and outcomes. In cases where capabilities and routines are not used interchangeably, capabilities are often seen as configurations or combinations of multiple routines providing organizations with a competitive advantage. The stream of research on routines as 'genes' has a tendency to focus on inertia and path-dependence (Parmigiani & Howard-Grenville, 2011) since routines are considered idiosyncratic to the firm, impeding its full transfer or replication to other contexts while the stream on routines as repositories for knowledge tends to emphasize change over stability through the learning aspect for organizations, seeing routines as providing a competitive advantage.

3.2.2 Practice perspective

The practice perspective is rooted in sociology and emphasizes the actor in performing routines, by looking at different aspects of routines, studying their development and internal dynamics.

Routines, from a practice perspective, are defined as “repetitive, recognizable patterns of interdependent action, carried out by multiple actors” (Feldman & Pentland, 2003, p. 95). Different in this definition compared with others is the statement that routines are ‘carried out by multiple actors’, in this way emphasizing the notion that routines are practiced or iterated over time by interacting individuals in a process of social construction. This social constructing of multiple actors incorporates the opportunity for both change and stability of routines. The practice perspective builds on two core foci: the role of human agency in producing action and the interaction between social constructs and human action (Parmigiani and Howard-Grenville, 2011). The first core assumption concerns human agency. Routines are enacted in everyday organizational life. Routines, when practiced, are enacted by human actors in a specific way, in a specific situation, providing the ground for change and stability of routines. Some routines are iterated more frequently than others (Feldman, 2000); consider for example two routines of an organization: its emergency protocol and its newsletter. The routine of the newsletter is iterated more frequently, providing the actors of the routine with an opportunity to alter the way in which the routine is practiced incrementally (alter the contents, receivers or sending moments of the newsletter depending on the interpretation of the actors involved). An emergency protocol, on the other hand, is only practiced in case of a real emergency or in a ‘dry run’, both of which are much less frequent events than an organization’s newsletter. Logically, the opportunity for routine change by individual actors is more likely with a frequently iterated routine such as a newsletter than with an emergency protocol. This human action in practicing

routines constitutes an internal dynamic with regard to routines: when practiced again and again over time, the routine will never be exactly the same (Feldman, 2000; 2003; Feldman & Pentland, 2003). The second core assumption involves the interaction between human action and social constructs. This relates to the 'interdependent action' part of the routine definition. Human action creates social constructs which, in turn, influence human action. Feldman and Orlikowski (2011) argue that this interaction entails that "stability and change [of routines] are different outcomes of the same dynamic, rather than different dynamics" (p. 6). The notion of an internal dynamic of routines through human agency led to the development of the distinction between performative and the ostensive aspects of routines (Feldman, 2000; 2003; Feldman & Pentland, 2003). The ostensive aspect of a routine can be thought of as the abstract pattern or structure of the routine whereas the performative aspect of a routine is the situated practice of the routine that involves human agency and specific actions. Feldman and Pentland (2003) argue that:

"the relationship between ostensive and performative aspects of routines creates an on-going opportunity for variation, selection, and retention of new practices and patterns of action within routines and allows routines to generate a wide range of outcomes, from apparent stability to considerable change" (p. 94).

Parmigiani and Howard-Grenville (2011) argued this distinction in routine aspects to be one of the most important accomplishments in the practice perspective. Becker (2004) states that the performative

and ostensive aspects of routines incorporate the behavioral and cognitive regularities of routines and that this accounts for both the stability and change observed in empirical studies on routines.

3.2.3 Differences between the capabilities and practice perspectives

The capabilities perspective argues that tacit knowledge is the source of an organization's competitive advantage: the more tacit knowledge is embodied in a routine, the more organization specific that routine becomes and thus the less susceptible to imitation by other organizations (Barney, 1991). For the practice perspective, however, tacit knowledge matters in how individuals enact routines. More tacit routines are harder to perform and replicate.

The importance of the context in which organizational routines develop has been stressed and approached differently by the capabilities and the practice perspectives. Becker (2004) addressed these differences, arguing that routines are context-dependent and historical, local and relation-specific. Routines are historically specific since a routine is a product of previous iterations in which the actor accumulated experience (cf. Zollo, Reuer, and Singh, 2002); local specificity refers to the situatedness of the action constituting a single performance of a routine and, finally, routines are relation specific in the sense that the performance of a routine depends on the relationship between the actors involved (Dyer & Singh, 1998; Dyer & Hatch, 2006).

The importance of human actors for organizational routines is more strongly embedded in the practice perspective than in the capabilities perspective, through the notion of agency and the performative aspect of routines. Both the capabilities perspective and the practice

perspective view organizational routines as a source of stability as well as change. The capabilities perspective acknowledges the dual nature of routines through the notion of 'regular' capabilities and dynamic capabilities, pointing to mechanisms in which organizations are able to pursue exploration and exploitation simultaneously. The practice perspective, on the other hand, locates this ambidextrous nature in the routine itself through its distinction between ostensive and performative aspects. Nonetheless, both perspectives argue that the simultaneous forces for stability and change are constrained by potential rigidity factors such as the interdependence of routines (Dyer & Hatch, 2006).

3.2.4 Interorganizational routines

As stated in the introduction, although the capabilities and the practice perspective stress different aspects of routines, they have in common that they have an intra-organizational focus and both overlook the role of routines at the interorganizational level. While the capabilities perspective is mainly focused on the organizational level and the practice perspective on a group or individual level (Parmigiani & Howard-Grenville, 2011), attention to routines on an interorganizational level has been very scarce to date. One of the first to call for research on the concept of interorganizational routines was Zajac (1998), whose comment was empirically followed up by Zollo, Reuer and Singh (2002) in their study of interorganizational routines in strategic alliances. Only recently did this scholarly effort receive some additional empirical (Mante & Sydow, 2007) and conceptual (Schussler, Wessel & Gersch, 2012) attention. What do

these studies tell us about IO routines and how are IO-routines different from their intraorganizational counterparts?

Zollo, Reuer, and Singh (2002) defined IO-routines as "stable patterns of interaction among two firms developed and refined in the course of repeated collaborations" (p. 701). As this definition points out, the focus is on a dyadic level, emphasizing stability of interaction patterns between two firms. In their study on biotechnology alliances, Zollo, Reuer, and Singh (2002) found partner-specific experience to be positively related to alliance performance; an effect that was dependent on the type of alliance governance. These authors focused primarily on knowledge accumulation and the creation of new opportunities as a result of prior interaction between firms. They state that "by engaging in multiple alliances with each other over time, partners might tacitly develop a set of routines which undergird the way they interact among themselves" (Zollo, Reuer, & Singh, 2002, p. 703). However, these authors do not elaborate on how such a set of routines might develop nor does their study discuss differences with routine development in IO projects (as opposed to alliances). Their study is clearly conducted from a capabilities perspective because of its focus on learning and performance and its treatment of routines as a black box.

An influential, much cited study in the sparse IO-routine literature is the work of Dyer and Singh (1998), who advocate 'the relational view', stating that an organization's competitive advantage resides in its interorganizational relationships. These authors identify four sources of IO competitive advantage, among which interfirm

knowledge sharing routines, defined as “a regular pattern of interfirm interactions that permits the transfer, recombination, or creation of specialized knowledge” (Dyer & Singh, 1998, p. 665). Just like in the paper by Zollo, Reuer and Singh (2002), this paper can be placed in the capabilities category, due to its focus on competitive advantage and the assumption that these interfirm knowledge sharing routines are purposefully designed and executed. The first contribution of these authors to our understanding of IO-routines lies in their discussion of how knowledge sharing routines lead to competitive advantage. Dyer and Singh (1998) argue that tacit, ‘sticky’ knowledge leads to competitive advantage as opposed to codifiable, transmittable knowledge. Even beyond the individual, Bechky (2003) shows how tacit knowledge underlying routines can divide groups of individuals, impeding coordination across groups. Here lies a second contribution of Dyer and Singh (1998) to our understanding of IO-routines: these authors view partner-specific absorptive capacity and incentives for cooperation as sub-aspects facilitating knowledge sharing routines. This is a refinement of the treatment of absorptive capacity in the learning literature, which tends to imply a capacity of an organization to learn equally from all other organizations. However, Dyer and Singh (1998) only consider dyadic alliances whereas their argument hints at additional significance in IO projects with multiple participants, since differences in absorptive capacity will be more important when the number of organizations involved in the IO-project increases.

Building on Dyer and Singh (1998), the study on the automotive industry of Dyer and Hatch (2006) found that Toyota achieved a

competitive advantage over U.S. car manufacturers although both use comparable supplier networks. They attribute this difference in performance to interorganizational knowledge sharing routines. These authors argued that “a firm’s internal routines or production capability may, to some extent, be contingent on the interorganizational routines which constitute the network ‘context’ linking the firm’s production system to the systems of its customers and suppliers” (Dyer & Hatch, 2006, p. 704). This observation suggests that IO-routines are relation-specific and are also linked to intra-organizational routines. Although they develop valuable insights, Dyer and Hatch (2006) only look at knowledge-sharing IO-routines, not discussing other possible types of IO-routines, for example, those directed at coordination or joint problem solving between organizations (e.g. Uzzi, 1997), which is likely to be particularly relevant in IO-projects with complex tasks. Besides this, the view of knowledge sharing routines of Dyer and Hatch (2006) is rather one-sided, coming down to the notion that suppliers adhere to Toyota’s way of doing things, as opposed to joint IO-routine development.

Mante and Sydow (2007), in their study of an international R&D joint venture, focus on how intraorganizational routines are coordinated and developed into interorganizational routines. These authors conclude that much of the scant IO-routine literature so far takes a capabilities perspective, neglecting concrete human actions taking place across organizational boundaries. Mante and Sydow (2007) argue that in the case of IO-routines the role of agency is overemphasized; they describe the ostensive and performative

aspects of two routines in a R&D joint venture between a German and Japanese organization and do so for both the intra- and interorganizational level on which these routines are practiced. Their study shows that routines on an interorganizational level are likely to be more a source of stability and less 'effortful' compared to intraorganizational routines. However, Mante and Sydow (2007) do not clearly define IO-routines and restrict their study to a dyadic interorganizational relationship.

Schussler, Wessel, and Gersch (2012) take a capabilities perspective in their conceptual study on capability development in IO-projects. This is shown by their understanding of what these authors term 'project capabilities', which is mainly concerned with learning in projects and gaining competitive advantage. These authors build on Brady and Davies (2004) and define project capabilities as "those activities needed to engage in pre-project bidding; to prepare and present proposals to partners and customers; and to manage the project lifecycle, including project implementation, handing results to customers, and ongoing support" (Schussler, Wessel, & Gersch, 2012, p. 172). Although this definition is stronger related to project management by a single organization then to interorganizational collaboration between firms, the added value of this study is the notion that project capabilities have the tendency to grow rigid over time. Schussler, Wessel, and Gersch (2012) argue that project capabilities can develop into network-based rigidities through IO-project learning which needs to be fitted to either exploration or exploitation over time. Although potential rigidity of project capabilities is a valuable insight for IO-routine research, these

authors treat project capabilities as a black box and neglect the interior processes of the IO-project.

Summarizing, IO-routines are based on collaborative experience developed between different interacting and autonomous organizational actors (Zollo, Reuer, & Singh, 2002). This experience relates to specific collaborative efforts, making IO-routines partner-specific (Dyer & Singh, 1998). The intraorganizational routines of the participating organizations in the IO-project constitute a context for relation-specific routines, creating an interdependent set of IO-routines (Dyer & Hatch, 2006). However, there is an interplay between intra- and interorganizational routines in which IO-routines are more likely to be a source of stability than their intra-organizational counterparts since agency leading to change of routines is less likely in IO-routines than in intraorganizational ones (Mante & Sydow, 2007). Even more than intra-organizational routines, IO-routines can become prone to rigidity over time (Schussler, Wessel, and Gersch, 2012).

While the few contributions to the IO-routine literature contribute valuable insights, this literature to date also shows some shortcomings. For example, the majority of the IO-routine literature focuses on learning and interorganizational knowledge sharing routines, leaving out other types of IO-routines, for instance directed at coordination or joint problem solving. However, these latter types of routines are likely to play an important role in IO-projects where organizations engage in close collaboration for the accomplishment of a joint task in a limited period of time.

In order to study the emergence of coordination routines in IO-projects, we build on the definition of Zollo, Reuer, and Singh (2002) and define IO coordination routines as "relatively stable patterns of interaction among three or more firms aimed at coordination and refined in the course of repeated collaborations" as a basis to start from. There is a need for such coordination routines because inter-organizational collaboration especially on complex tasks is far from easy due to the lack of traditional hierarchy and high levels of interdependencies. Examples of IO coordination routines, for instance in a large scale infrastructure project, could be informal communication between the contractors and suppliers during institutionalized coffee breaks, a series of formal construction meetings or an electronic interface for construction drawings and schedules.

3.3 Emergence of IO-routines: Antecedents

Considering the insights and especially the shortcomings of the IO-routine literature to date, a systematically exploration of the antecedents of coordination routine emergence in IO-projects is considered important in order to further deepen our understanding of IO coordination routines. We do so by building on theoretical insights from the capabilities and the practice perspectives and systematically relating these to Bakker's (2010) classification of temporary forms into context, time, task and team. Bakker (2010) based these dimensions on Lundin and Soderholm (1995) and his thorough literature review on temporary organizational forms. In our reading, these dimensions are essential elements in theory building

on temporary forms and are therefore suited for structuring our thinking on IO coordination routines.

3.3.1 Context

In traditional project management research, the most prevalent approach has been toward the autonomous, isolated project (Bakker, 2010). Engwall (2003) argued that this lack of context in project research leads to a failure of effectively explaining the internal processes of projects. He argued that "a project needs to be conceptualized as a history-dependent and organizationally-embedded unit of analysis. Thus, this calls for an ontological change; instead of lonely and closed systems, projects have to be conceptualized as contextually-embedded open systems" (Engwall, 2003, p. 790). This embeddedness of IO-projects in their environment is also found in the work of other scholars (Grabher, 2002a, 2004; Jones and Lichtenstein, 2008; Bechky, 2006). The significance of the context of IO-projects for their functioning and internal processes has gained considerable attention in the current academic debate and in his literature review Bakker (2010) concludes that "the contextual perspective, highlighting the importance of the exterior environment of temporary organizational forms for interior processes, is one of the major accomplishments in temporary systems research in recent years" (p. 481).

In general, IO-projects are thought of as being temporally and organizationally embedded. Temporal embeddedness places the IO-project in a background of prior and future interactions between the project participants whereas organizational embeddedness places the IO-project in long-term patterns of inter-organizational interaction

going beyond the scope and duration of the IO-project that are known as ‘macrocultures’ (Jones & Lichtenstein, 2008), ‘latent networks’ (Grabher, 2002a) or as ‘structured role systems’ (Bechky, 2006).

The main importance of the context dimension for IO-projects lies in the emphasis placed on the influence of the external surroundings on the internal workings of the IO-project (Bakker, 2010). These external surroundings cross temporal and organizational boundaries: IO-projects are influenced by experience from prior collaborations and expectations of future interactions between project participants (the temporally embedded nature) and the more enduring relationships among the constituting ‘parent’ organizations involved in the IO project (the organizationally embedded nature). Concerning routines, taking into account the temporal and organizationally embedded nature of the IO-project context makes this temporary form less radically different from its intraorganizational counterparts, and generally help us understand how routines can develop in this context. We will now look how these aspects of the context dimension may be expected to influence IO coordination routine emergence.

With regard to the temporal embeddedness of the IO-project, it is more likely that IO-routines aimed at coordination will emerge when the project is strongly temporally embedded, i.e. when experiences of prior interactions and expectations for future interactions among the project participants exist. These will facilitate shared understandings and expectations about how to act in the project, fostering the development of collaborative IO-routines. Zollo, Reuer

and Singh (2002) deem the temporal embeddedness of IO-projects sufficiently fundamental to include in their definition that IO-routines are "developed and refined in the course of repeated collaborations" (p. 701). Although the IO-project is a temporary effort, its participants can rely on experiences and knowledge gained from prior interactions and supported by more enduring organizational relationships for the 'swift' development of IO-routines (referring to the idea of swift trust from Meyerson, Weick and Kramer, 1996). In addition, the expectation of future interactions increases the relevance and incentive of IO-routine transfer to the more latent underlying context of the project network.

With regard to the organizationally embedded nature of the IO-project, IO coordination routine emergence is more feasible to the extent that organizational embeddedness of an IO-project provides "understandings and rules for collaboration that distinct organizations bring to their joint activities, reducing transactional uncertainty and facilitating coordination" (Jones & Lichtenstein, 2008, p. 239). When organizations have a latent network of relationships with other organizations that is more enduring than the IO-projects they conduct, is it likely that certain general understandings and expectations about how to act are in place, such as established communication links. This is especially probable among organizations in the same industry or performing similar types of tasks. When organizations from the same latent network have these established relationships and participate in an IO-project, the emergence of IO coordination routines in the project are likely since

the participants have a common foundation to start from concerning coordination of the IO-project.
Thus, shared understandings about collaboration in the IO-project, fostering the emergence of IO coordination routines, can come about from either the experience of previous interactions in IO-projects or the constituting parent organizations being in the same latent network of more enduring underlying relationships going above and beyond the scope of the IO-project.

A higher degree of isolation of the IO-project from its context in terms of temporal and organizationally embeddedness increases the possibility of IO coordination routines to be more idiosyncratic to the project, i.e., if IO-project participants have not collaborated with each other in the past and their constituting parent organizations have no shared understanding about how to collaborate, the project participants have to start from scratch; developing their own understandings about how they should work together and perform the task at hand. The IO coordination routines that will develop are, in such a case, likely to be based on the interaction in the focal IO-project itself and less applicable in other project contexts. Sydow and Staber (2002) add to this issue by stating that on the one hand IO projects have a need for flexibility due to goal achievement in a temporary setting while on the other hand they "require a certain degree of stability and durability, to facilitate coordination and develop a community of practice" (p. 226). This implies that the ostensive aspect as the more stable part of routines and the performative aspect as the more flexible part of routines are as much of importance to IO-routines as to organizational routines.

3.3.2 Time

Time is the unique, key, and multi-dimensional element that distinguishes temporary forms from non-temporary ones (Janowicz-Panjaitan, Bakker & Kenis, 2009). Traditional project management views time in IO-projects often in terms of linearly ordered phases from start to end, explaining action in different phases of the project based on sequencing (Lundin & Soderholm, 1995). Even more, time is often seen as a resource and conceptualized as either time pressure or duration, i.e., as a manageable and objective dimension. However, many studies show that people and groups of people can differ in their perception and implementation of time (Ancona, Okhuysen & Perlow, 2001; Lee & Liebenau, 1999). Jones and Lichtenstein (2008) describe time in IO-projects as "the expected duration of an IO project and how this expected duration creates mechanisms that shape the coordination of collaborative activities between organizations" (p. 233). Therefore, time as duration or pressure and differences in time perceptions are likely to hold implications for the emergence of IO coordination routines.

The question how recurrent patterns of action in the IO-project are developed between different organizational participants with regard to time as either short or limited duration is rather unequivocal: IO-routines for the coordination of collaborative activities need time to develop and thus are less likely to arise in the short time span of an IO-project. In order to settle they also need time to recur which is less likely in limited time spans. In other words, longer IO-project duration increases the chance of IO coordination routine emergence. Concerning time as pressure, it can be argued that when time

pressure increases because of the impending termination of the IO-project, participants will fall back on their own organizational routines for the accomplishment of the task at hand since the focus in the IO-project will shift towards immediate action. This decreases the chance of IO coordination routines to emerge.

In case of an IO-project, actors from different organizational backgrounds can differ in time perceptions, mapping activities to time and their own relating to time, referring respectively to the idea of what time is, the planning and pacing of activities and how an actor deals with and uses time (Ancona et al., 2001; Jones & Lichtenstein, 2008; Lee & Liebenau, 1999). Since time and the perception thereof are inextricably interwoven with individual cognition and action, IO-project participants are likely to hold different organizational routines at the start of the IO-project. The question, then, how recurrent patterns of action in the IO-project are developed between different organizational participants, each with its own temporal perception, is relevant in light of the coordination function of routines (Becker, 2004). The need for coordination in an IO-project is relatively high compared to intraorganizational projects due to different organizational backgrounds of the project participants and the functionally interdependent but legally autonomous nature of the IO-project. Part of the different organizational backgrounds of the IO-project participant is the temporal perception which includes pacing and rhythm of activities.

In order for IO coordination routines to be interorganizational, they have to emerge collectively among the IO-project participants and thus be rooted in synchronized activities or collective action. If not

collectively held it would be more accurate to speak of different organizational routines of participants instead of IO-routines. If not synchronized, collective action and IO-project coordination become difficult because of temporal misfit between the different organizational routines of the participants (Dille & Söderlund, 2011), and the likelihood of IO coordination routine emergence decreases. Jones and Lichtenstein (2008) argue that entrainment-based pacing, i.e., synchronizing collaborative activities, enhance IO-project coordination while stating that "…entrainment-based pacing affects all actors in a project network […] although not necessarily equally" (Jones & Lichtenstein, 2008, p. 238). This indicates that synchronization might be more difficult or costly for IO-project participants that are more different from others in the IO-project. For example, IO-projects entailing complex tasks often span different industries. Different organizational actors from the same industry are likely to have some overlapping temporal norms as to when and at what pace activities should be performed. A project participant from another industry is likely to experience more trouble synchronizing to these temporal norms as opposed to the ones from the same industry.

Summarizing, IO-project participants may hold different perceptions of time which can impede or facilitate the collaboration process. These different time perceptions need to be synchronized in order for IO coordination routines, which are based on collective actions and shared understanding of the pacing of these actions, to emerge. In addition, longer IO-project duration increases the chance of IO

coordination routines to emerge while time pressure decreases this chance.

3.3.3 Task

As indicated by Grabher (2002a) and Lundin and Soderholm (1995), the legitimacy of an IO-project is mainly related to its given task. Task definition draws a boundary between the IO-project and its environment and provides the project its *raison d'être* (Lundin & Soderholm, 1995). If the specific task could be executed by the separate organizations then there would not be an incentive to engage in an IO-project. This task boundary implies that tasks of IO-projects are limited: as soon as the task is completed, the project team disbands. This emphasis on task completion causes problems with regard to learning from project experience (Grabher, 2002b), focusing more on the task at hand then on personal interaction (Saunders & Ahuja, 2006) and stressing action instead of decision-making (Lundin & Soderholm, 1995). Lundin and Soderholm elaborate on their action-perspective when they state that IO-project tasks can fundamentally differ between being unique or repetitive to the IO project participants:

"When a temporary organization is assigned a repetitive task, the actors know what to do, and why and by whom it should be done. Their experiences are similar and they share a common interpretation of the situation. However, when the task is unique, nobody has immediate knowledge about how to act" (Lundin & Soderholm, 1995, p. 441).

Thus, repetitive tasks lead to similar experiences of IO-project team members and are associated with appropriate courses of action. Contrary to this, unique tasks are characterized by a lack of knowledge about means end relations and appropriate experiences from related fields that can be applied to the unique task at hand (Lundin & Soderholm, 1995). Task uniqueness and task complexity are often conceptualized as being dichotomous but "it seems that these are more likely variables that can take on many intermediate degrees, pertaining to different elements of the task" (Bakker, 2010, p. 478).

Sahlin-Andersson (2002) discusses the notion of 'task boundary work' which is referred to by Lundin and Soderholm (1995) as 'the social process of task-making' (p. 441). Along the duration of an IO-project, task boundaries shift, are adjusted and redrawn by the actors involved in the IO-project. The argument is that task definition, or setting the task boundaries, is not a single parsimonious action but "an ongoing interpretive and rhetorical activity" (Sahlin-Andersson, 2002, p. 245). Take for example the event of an earth quake or some sort of disaster. Crisis teams and rescue workers respond to the specific event in what they call a 'rescue mission'. After some time, certain rescue actions are suspended and what was before a rescue mission is now termed a 'recovery mission': the task boundaries of the IO-project are redrawn, its legitimacy to the surrounding environment is enhanced and it allows for other parties to enter or leave the IO-project. So, task characteristics determine the kind of experiences and knowledge of organizational members in combination with certain courses of action that are required to complete the IO-project task. Based on their implications for

appropriate courses of collective action, task complexity, uniqueness and interpretation are likely to be of importance for the emergence of IO coordination routines.

With regard to task complexity, the need for coordination among project participants increases when the task is more complex, i.e., consists of many interrelated parts, which increases the interdependence between project participants. However, tasks that are more complex will less likely lead to the emergence of IO coordination routines since the interrelated parts of a complex task create various alternative routes to complete the task, making the appropriate course of action more ambiguous (Campbell, 1988).
With regard to task uniqueness, the emergence of IO coordination routines is less likely since IO-projects with more unique, one-off tasks create a situation in which it is far from clear who should be doing what with these type of tasks. However, when the IO-project task at hand becomes more repetitive the likelihood of IO coordination routines to emerge increases since links between interdependent actors and subsequent actions in the IO-project are established. This difference in likelihood of IO-routine emergence for the extent to which tasks are unique is also pointed out by Brady and Davies (2004) who refer to IO-routines as 'project capabilities', implying a learning effect by iterating the same task by IO-project participants. Or as Bakker et al. (2011) put it: "through experience, firms can develop explicit knowledge and routines in how to most optimally execute project tasks" (p. 784). Task repetitiveness is different from temporal embeddedness because in the latter case the

focus is on the identity of the collaborating organizations, not on the identity of the successive tasks.

With regard to task interpretation or task boundary work, IO-project participants need to come to a shared task interpretation in order to determine appropriate courses of collective action. This is in the team literature referred to as team mental model similarity; i.e. shared knowledge and expectations about the task and team between team members (Mohammed, Ferzandi, & Hamilton, 2010). Interpretation of the task that the IO-project is set out to do in the first place and adjustments made to that task are initially related to IO coordination routines since it increases the requirement of consensus between organizations and their representatives involved in the IO-project in order to avoid problems of legitimacy and task interpretation. Since IO coordination routines contribute to task accomplishment, it is obvious that a shared task interpretation among project participants is required for the development of IO coordination routines. When task interpretation differs among those involved in the IO-project, contrasting courses of action can co-exist, decreasing the likelihood of IO coordination routines to emerge.

Summarizing, task complexity decreases the likelihood of IO coordination routine emergence due to the interrelated parts of a task making the completion of a task more difficult. Task uniqueness decreases the extent to which IO coordination routines will emerge since clear courses of appropriate collective action are lacking. A shared task interpretation among the IO project participants in contrast will direct collective action increasing the likelihood of IO coordination routines.

3.3.4 Team

Lundin and Soderholm (1995) identify three characteristics of IO-project teams. First, a team is formed around the joint task that needs to be accomplished. This implies that individuals in IO-projects are selected based on their experiences and skills that fit the task at hand. Second, participation is often predefined due to the time-limited and task-oriented nature of the IO-project creating expectations about individual contributions and roles. Third, team members are pulled away from their permanent organizations and allocated to the IO-project team. This implies that "individuals have other 'homes' before, during and after being involved in a temporary organization, which means that the team is dependent on other organized contexts besides the current temporary organization" (Lundin & Soderholm, 1995, p. 442). Based on these team characteristics, we argue that team diversity and size are of essential importance for the emergence of IO coordination routines since routines are grounded in human behavior (Cohen, 2007) and are based on collective patterns of action.

With regard to team diversity, we make a distinction between surface-level and deep-level diversity (Harrison, Price, Gavin, & Florey, 2002). Surface-level diversity refers to individual differences in skills and expertise in the IO-project team, whereas deep-level diversity is about the differences in organizational backgrounds and subsequent collaborative knowledge brought along by individuals into the IO-project. Concerning surface-level diversity, project participants often hold diverse knowledge and complementary sets of skills required for the task at hand (Goodman & Goodman, 1976).

Even more, knowing that the IO-project will end with the accomplishment of a specific task or at a given time can be a condition to accept contradictory expectations of individuals in the team (Lundin & Soderholm, 1995) in which case the surface-level diversity of the IO-project team is further increased. The importance of team diversity was also pointed out by Nelson and Winter (1982, p. 105) when they stated that "the context of the information possessed by an individual is established by the information possessed by all other members" implying that the procedural knowledge about how things are done (Becker, 2004) underlying routine performance is key to the IO-project team.

With regard to surface-level diversity, more diverse individual actors in the project team lead to a higher need to coordinate these differences in skills and knowledge for the accomplishment of the IO-project task. Also, surface-level diversity in the IO-project team, indicating differences in expertise of team members, relates to different parts of the task being the responsibility of different team members. Therefore the likelihood of IO-coordination routines to emerge is higher when surface-level diversity in the project team increases since when team members have diverse and complementary expertise this necessitates more interaction within the IO team, making who is supposed to do what more easily visible. However, when surface-level diversity in the IO-project team becomes too high, shared understanding and individual differences between team members become too large, making the integration of the different parts of the task that each team member is supposed to do more difficult and the possibility to form IO routines less likely. This aligns with the idea of an optimal level of this type of diversity:

surface-level diversity facilitates the emergence of IO-coordination routines through pinpointing responsibilities in the IO team. However, only up to a certain point, from where it begins to impede understanding between IO team members and as a consequence decreases the likelihood of IO coordination routine emergence.

In contrast to the surface-level effect of team diversity, there is also a simultaneous influence on the emergence of IO coordination routines at play, namely the more implicit, deep-level diversity of team members. For IO coordination routines to develop, understandings concerning the IO-project must become shared among project participants, since routines are collective interaction patterns (Becker, 2004). When the knowledge held by team members and based on their respective organizational backgrounds is highly diverse, the establishment of shared understandings in the IO-project team becomes more problematic, impeding the emergence of IO coordination routines. In other words, an IO-project team in which members have similar knowledge about how things are done, IO coordination routines are more likely to emerge as opposed to IO-project teams in which members have more diverse knowledge on how things need to be done.

Taken together, diversity in IO-project teams relates to individual differences in expertise, skills, and organizational backgrounds and knowledge on how things are done brought along by project participants. Surface-level diversity, leading to more intensive interaction, up to a certain level is expected to increase the likelihood of IO-coordination routines to emerge since responsibilities in the team become more easily visible as opposed to IO-project teams where members have similar expertise and responsibilities are less

clear cut. At very high levels, however, we believe that surface-level diversity will negatively influence the formation of IO routines. We believe deep-level diversity in contrast to universally decrease the likelihood of IO coordination routine emergence when organizational backgrounds of project participants are more different.

With regard to team size, we refer to the number of organizations participating in the IO-project. Thus, if an organization has more than one individual actor in the IO-project the number of individuals in the IO-project increases whereas we consider the number of participating organizations to remain the same. This set of organizations involved in the IO-project is considered a relevant aspect of the team dimension posing a great challenge to the local context in which an IO-routine is to be performed (Shenhar, 2001; Bakker et al., 2011). The importance of the IO-project team size was already stressed in the introduction of this paper when we identified the flaw of the IO-routine literature to focus primarily on dyadic IO-projects, neglecting the implications of multi-organizational projects (Das & Teng, 2002).

Coping with individual differences also becomes more problematic when the number of individual participants increases but the same goes for intraorganizational project teams. The increase in organizational backgrounds brought along by the different project participants is what complicates IO coordination routine emergence. When the number of organizational project participants increases, the difficulty of coordinating the different organizational backgrounds of member's knowledge on which IO coordination routines are based increases along with it (Doz & Hamel, 1998).

Summarizing, we related insights from the capabilities and the practice literature to the IO-project dimensions of context, time, task and team and identified several antecedents for IO coordination routine emergence. Regarding the context dimension, the temporal and organizationally embeddedness of the IO-project will provide experience and knowledge to build IO coordination routines on although isolation of the project increases the tacitness of its routines, impeding transfer to future collaborations. IO coordination routines are to some degree dependent on the latent networks underlying the IO-project as the foundation for the ostensive part of IO-routines whereas the project itself is the arena of the performative aspect of IO-routines.

Regarding the time dimension, longer IO-project duration in combination with a synchronization of collective action will increase IO coordination routine emergence. Project duration will contribute to IO coordination routine emergence by giving routines opportunity to emerge and recur. However, time pressure decreases the likelihood of IO coordination routines to emerge since participants might fall back to their own organizational routines under a stronger focus on task completion.

Regarding the task dimension, more complex tasks require more coordination among IO project participants but clear courses of action are less obvious due to the interrelated parts of a complex task thus decreasing the likelihood if IO coordination routine emergence. Furthermore, when tasks are more unique, clear courses of appropriate collective action are lacking which makes the emergence of IO coordination routines less likely. This appropriate collective action is directed by a shared task interpretation among

the IO project participants which increases the likelihood of IO coordination routines to emerge.

Regarding the team dimension, surface-level diversity relates to individual differences in expertise and skills of team members whereas deep-level diversity points to different organizational backgrounds of team members. There is a higher level of coordination required when surface-level diversity increases and this type of diversity also points out responsibilities of team members based on their respective complementary expertise. This makes the emergence of IO coordination routines more likely up to a certain point when individual differences become too large, impeding mutual adjustment among team members. The likelihood of IO coordination routine emergence decreases when deep-level diversity is higher. Furthermore, mutual adjustment between multiple organizations becomes increasingly difficult with increasing numbers of organizations in the IO-project, thus making it less likely for IO coordination routines to emerge.

3.4. Discussion

In this article we argued that routines in general and coordination routines in particular are fundamentally different in IO-projects compared to intraorganizational projects. Several antecedents of the emergence of IO coordination routines were identified. We will now discuss the implications of this analysis. IO coordination routines are of pivotal importance for the success of IO-projects since regular coordination mechanisms such as a formal hierarchy are less prevalent when organizations are functionally interdependent but

legally autonomous. Routines in general can lead to both rigidity and learning. Following Schussler, Wessel, and Gersch (2012), we also assume rigidity and learning as possible consequences of coordination routines in IO-projects which might impede or foster IO-project performance. The question is: will IO routines be more likely be a source of rigidity, or of learning?

3.4.1 Routine rigidity and learning

Considerable scholarly effort in organizational routine literature, especially from the capabilities perspective, has focused on routine rigidity issues (cf. Gilbert, 2005), i.e., the tendency of routines to grow rigid, leading to slow or non-adaptation of routines in the face of changing external demands. In this regard, Schreyögg and Kliesch-Eberl (2007) identify, among others, path dependency and structural inertia as main processes leading to rigidity of routines. Path dependency and structural inertia are related but distinct phenomena pointing respectively to a process in which self-reinforcing mechanisms potentially lead to lock-in (Vergne & Durand, 2010) and the organizational tendency for sticking to stabilized structures despite environmental change (Schreyögg and Kliesch-Eberl, 2007). Since IO-routines do not relate to the action patterns of a single organization but are the product of a collaborative process over time between multiple actors with different organizational backgrounds, path dependency and inertia could be amplified because they no longer influence particular organizational routines but affect constellations of routines originating from different organizational actors. In other words, IO-routine rigidity is more difficult to overcome as opposed to intraorganizational routine rigidity since the underlying

pattern of interaction involve multiple organizations which have to act together if they want to change IO coordination routines, as opposed to a single organization changing its own patterns of action. Where a single organization is assumed to exert some level of autonomy in altering its configuration of routines, this is more problematic when the configuration of IO coordination routines requires consensus among the participating organizational actors in the IO-project. This will impede adaptation and increase the tendency to rely on established stable patterns. This is especially true for multi-organizational projects, where more than two organizations are involved, slowing down coordination of the project through mutual adjustment.

Issues of rigidity in general and path-dependency in particular are especially emphasized by the capabilities perspective since “the outcome of path-dependent capability development is more likely to be positive for the firm when asset complementarities, learning specialization, or increasing returns to scale and scope prevent imitation by its competitors” (Vergne & Durand, 2010, p. 740). This shows the interest from the capabilities perspective: path-dependent development impedes imitation by competitors, leading to competitive advantage. However, “as organizations develop greater competence in a particular activity, they engage in that activity more, thus further increasing competence and the opportunity cost of exploration” (Levinthal & March, 1993, p. 106). With regard to IO coordination routines, increasing competence in collaboration with the same project partners can trigger path-dependent processes which provide initially competitive advantage over other groups of organizations but could in time lead to potential lock-in: rigid IO

coordination routines which have detrimental effects such as an inability of the IO-project to respond to environmental changes or being able to execute the task the IO-project was set out to accomplish in the first place.

Although temporal and organizational embeddedness are likely to contribute to IO coordination routine emergence through prior experience and knowledge on which routines are based, they are also likely to provide a possible source of rigidity (Grabher, 2004; Schussler, Wessel & Gersch, 2012). If organizations have collaborated before, the likelihood of similar IO coordination routine emergence in a next IO-project with these organizations involved is probable. So, collaborative IO-routine rigidity issues are likely when organizations with a collaborative history start to participate in IO-projects with a different task, posing different requirements to the collaboration. However, if these organizations continue to collaborate in IO-projects with similar tasks IO routine rigidity is less likely to be an issue since the underlying logic of IO-routines for collaboration also applies to the new IO-project setting.

Task boundary work (Sahlin-Andersson, 2002) might render IO coordination routines rigid over time: since task boundary work is an ongoing social process of setting boundaries, performed between IO-project participants, it is likely that when task boundaries shift IO coordination routines in use might become non-adapted in light of the new collective task and subsequent interpretation by the project participants. Because routines have a tendency to lead to, and are supported by, stabilized structures, changing coordination routines of an IO project might not happen synchronous with the shift in the IO project task.

As we stated before, IO coordination routines do not only inhibit a tendency to rigidity but also allow for learning and thus for change. The notion of agency of project actors in executing routines is important since it accounts for routine change and routines have been conceptualized as the mechanism through which organizations learn. In that sense, IO coordination routines might function as a source for network learning (Knight, 2002). “Just as habits replicate from individual to individual, routines replicate from group to group and from organization to organization” (Hodgson & Knudsen, 2004, p. 291). Extending this logic, coordination routines replicating from IO-project to IO-project might also hold value for the network literature explaining differences in the performance of networks. The idea of the practice perspective of the duality of ostensive and performative aspects of routines can prove insightful here. This is hinted at by Schussler, Wessel, and Gersch (2012) when they state that “interorganizational project learning resides on two different levels: the level of current project participants, and the field level on which past experiences are stored as collective memory or institutionalized practices” (p. 177). This is also found in the ideas of historical, relational and local specificity of Becker (2004): on the one hand the local specificity of IO coordination routines is identified within the project (were actions are performed) while on the other hand the historical and relational specificity can be seen in terms of respectively the temporal and organizational embeddedness of IO-projects. This implies that the learning context of IO coordination routines is grounded in the community (Cohendet & Llerena, 2003), or what Grabher (2002a; 2004) refers to as the project ecology.

Contrary to organizational routines in which the performative and ostensive aspects are located in the actual performance of a routine by a specific actor, this is likely not the case with IO coordination routines. Cohendet and Llerena (2003) state that “the local context in which routines emerge and learning takes place does matter, and leads to routines that strongly differ in terms of power of replication, of degree of inertia, of search potential” (p. 271). In the case of IO coordination routines, it can be argued that the performative aspect, the actual execution of the coordination routine, is substantiated inside the IO-project. Project participants have a relatively high degree of agency in performing routines concerning the relationship between the individual members and the IO-project team, allowing for possible adaptation in routine iteration. In contrast, the ostensive aspect of IO coordination routines is likely to reside in the more enduring network of relationships, decreasing the possibility of autonomous agency of IO-project team members. Put differently, IO project team members can enact a routine differently in a focal project (the performative aspect), but that in itself does not change the abstract patterns associated with the routine by other members of the relevant community not involved in the focal project. In the terminology of Feldman and Pentland (2003) variation and selection of practices and patterns of actions takes place within a focal IO project, but retention of the selected variations after the focal project team is disbanded is less likely than in the intra-organizational context. This relative isolation of the ostensive from the performative aspects of IO coordination routines promotes stability, but at the same time it creates the threat of overly path-dependent processes

that are not sufficiently responsive to changing conditions and needs encountered in projects.

3.4.2 Limitations and recommendations for future research

The focus of this paper was on IO coordination routines since the coordination of activities of legally autonomous but functionally interdependent actors is a core issue in multi-organizational projects. However, many other types of IO-routines might be important in these kinds of projects. For example, we argued that IO coordination routines are more likely to develop in relation to tasks that are more repetitive in nature as opposed to tasks that are more unique. However, it should be noted that with unique tasks knowledge on appropriate experience from related fields is lacking with project participants. This implies that, although IO coordination routines are less likely to develop with more unique tasks, the emergence of search routines for joint problem solving are more likely to develop between project participants since the need for knowledge on means end relations is more stronger in unique IO-projects. We did not account for other types of IO-routines that might emerge in IO-projects since it would go beyond the scope of this paper and we deem coordination to be a core issue in IO-projects. However, future research might study the extent to which the antecedents identified in this paper also account for the emergence of other types of IO routines. Exploring the emergence of other types of routines might prove fruitful for the research on project performance. IO coordination routines might not emerge in some IO-projects while these projects for instance develop search routines for joint problem

solving which gives them a stronger position for learning and innovation.

The focus of this paper was on IO coordination routines but it should be noted that coordination between legally autonomous but functionally interdependent actors does not solely depend on routines that emerge for this purpose. For example, Stinchcombe (1985) argued that contracts include many hierarchical elements and as such have a coordinating function for exchanges between organizations. The extent to which IO coordination routines are complementary or substitute for other forms of coordination, such as contracts, might advance research on the structure and functioning of temporary interorganizational forms.

A limitation of our paper is that we, albeit implicitly, assume the processes of mutual adjustment and IO coordination routine emergence to take place on a relatively equal basis among the participating organizations. However, as Feldman (2000) and Friesl and Larty (2013) pointed out, routine emergence constitutes a political aspect, addressing issues of power and dominance in the IO-project. Future research could focus on network leadership or dominance and explore how some organizations may impose their own routines on the IO project. Future research in this direction will take the power aspect on the intraorganizational level (Szulanski, 1996) to the interorganizational level broadening our insights on IO coordination routine emergence.

In addition to the power aspect of routine development, we believe IO-projects with a number of project participants above two will

represent a so-called multi-actor issue[9] (Das & Teng, 2002) in which dominance and power concerns between organizations will be amplified. These multi-organizational projects are characterized by generalized social exchanges, meaning that social exchange and subsequent expectations about reciprocation become blurred between participants within the IO-project (Das & Teng, 2002). Future research will not be able to focus on network leadership or dominance without also addressing the multi-actor issue posed by Das and Teng (2002). When we consider the emergence of IO coordination routines from a social exchange perspective, questions about the visibility to project participants of routine elements origins or adoption of routines by others in the multi-organizational project might shed light on routine development in interorganizational relationships which are not based on equality of participants. Consider for example a multi-organizational project with a main contractor and several subcontractors. To what extent are the organizational routines of the main contractor the basis for the IO-routines adopted by the subcontractors? Do these subcontractors have knowledge about where IO-routine elements stem from? This might be less the case in a multi-actor setting as opposed to a dyadic one.

We discussed the likelihood of IO coordination routine emergence but we also want to emphasize that in some IO-projects coordination routines might not develop at all. In IO-projects in which coordination routines do not emerge project participants will have to rely either on their own organizational routines (which may clash with those of

[9] We explore the multi-actor issue in depth in chapter four of this dissertation.

other parties in the project) or on improvisation. In the former case, the IO-project will likely be less effective and in the latter opportunities for learning will be very limited. At the extreme, with pure improvisation of project participants, neither rigidity nor learning will take place due to the isolated nature of the IO project.

3.5 Conclusion

The goal of this paper was to deepen our understanding on how coordination routines can emerge in interorganizational projects. This goal was accomplished by theoretically exploring insights from the capabilities and the practice literature and systematically relating these to the interorganizational project dimensions of context, time, task and team. Several antecedents for the emergence of interorganizational coordination routines and their expected effects were identified. These antecedents and their expected effects are summarized in table five. We defined IO coordination routines as "relatively stable patterns of interaction among three or more firms aimed at coordination and refined in the course of repeated collaborations" (Based on Zollo, Reuer, and Singh, 2002).

Table 5. Antecedents of IO coordination routines

	Antecedents of IO coordination routines	Expected effect on formation of IO coordination routines
Context	Temporal embeddedness	+
	Organizational embeddedness	+
Time	Duration	+
	Pressure	-
	Synchronization	+
Task	Complexity	-
	Uniqueness	-
	Interpretation	+
Team	Surface-level diversity	∩
	Deep-level diversity	-
	Size	-

We contribute to the growing body of research on interorganizational routines in two ways. First, we set interorganizational routines apart from their organizational counterparts by comparing the capabilities and practice perspectives with the IO-routine literature. By doing so, we addressed routines at the interorganizational level which is especially relevant given the growing prevalence of IO-projects. Second, our systematical analysis of the emergence of IO coordination routines strengthens the nascent IO routine literature by addressing some of its shortcomings, such as a strong focus on interorganizational knowledge sharing routines. Our overview of

antecedents might provide managers and stakeholders of IO-projects with more insight in how to manage and understand them now and in future interorganizational collaborations.

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Chapter 4

Quid Pro Quo: Collaborative Learning and Social Exchange in Multi-organizational Projects

4.1 Introduction

Interorganizational projects (henceforth IO projects) are generally defined as "two or more organizational actors from distinct organizations working jointly to create a tangible product/service in a limited period of time." (Jones & Lichtenstein, 2008, p. 234). This definition, like several others, refers to IO projects with 'two or more' participants. However, research on interorganizational forms has only sparsely focused on the differences between dyadic IO projects and multi-organizational projects, nor on the learning implications of these differences (Knight, 2002; Gomes-Casseres, 1994; Hwang & Burgers, 1997; Jones, Hesterly, Fladmoe-Lindquist, & Borgatti, 1998). Das and Teng (2002) argue that the essential difference between the two lies in social exchanges becoming generalized when the number of IO project participants reaches three or higher. They argue that:

Restricted social exchange occurs when two parties directly exchange favors with each other, which is also known as dyadic or mutual exchange. In contrast, generalized social exchanges take place among a group of at least three parties, and *there is no direct reciprocity among them* (Das & Teng, 2002, p. 448, original emphasis).

The key characteristic of generalized social exchange pertains to indirect reciprocity between project participants, as opposed to restricted social exchanges which have direct reciprocity and consequently high accountability between parties. Indirect reciprocity, in this context, refers to organizational appropriation from

the multi-organizational project being either non-observable and/or lagged in time. Hence, multi-organizational projects display generalized social exchanges which, for example, increase the risk of free riding and increase the need for trust (Das & Teng, 2002). However, the fact that social exchange becomes generalized when the number of project participants reaches three or higher, leading to indirect reciprocity between organizations in IO projects, has not yet gained full scholarly attention. For example, Muthusamy and White (2005) apply a social exchange perspective on interfirm learning but focus solely on dyadic relationships, neglecting the exchange implications of indirect reciprocity in multi-organizational collaboration.

The current paper argues that the implications of indirect reciprocity are especially understudied in relation to learning in collaboration since learning in IO projects is by definition relational and characterized by social exchanges between project participants (Larsson, et al., 1998; Huxham & Hibbert, 2008, Knight, 2002). IO projects, being either dyadic or multi-organizational, create a context for organizations in which collaborative learning has become a rather difficult yet essential aim to achieve (Inkpen, 2000; Larsson, et al., 1998; Lubatkin, Florin, and Lane, 2001; Hwang & Burgers, 1997). Collaborative learning, viewed as learning from as well as with each other (e.g. Huxham & Hibbert, 2008), has in the extant learning literature been described in contrasting terms referring to the classic tension between collaboration versus competition. Larsson et al. (1998) term this tension the 'interorganizational learning dilemma', which they describe as:

"It being individually rational for an organization to pursue the maximum organizational share of the joint learning by taking more knowledge than it gives. At the same time, this relative withholding of knowledge reduces the total amount of joint learning from which the organization attempts to appropriate its share" (p. 288).

This description of the dilemma of learning in IO projects points to a stream in the literature focusing on collaboration as a tool for learning, encompassing joint knowledge creation and the exchange or transfer of knowledge between organizations within the IO project (Huxham & Hibbert, 2008; Larsson et al., 1998; Hibbert & Huxham, 2005; Muthusamy & White, 2005). Although Larsson and colleagues (1998) claim to study interorganizational learning, their work is criticized by Knight (2000; 2002) for remaining on the dyadic level and fail to view learning on a network level, for example the multi-organizational project. Therefore, the current paper defines collaborative learning as the collective creation and exchange of collaboration knowledge among a set of organizations (based on Larsson et al., 1998, p. 287, emphasis added). By applying this definition, the paper incorporates two important aspects. Firstly, the focus is on the collective or joint characteristic of collaborative learning. Secondly, the two-fold aspect of collaborative learning is acknowledged, entailing both collective knowledge creation as well as acquisition between organizations within the IO project.

Summarizing, the question arises how collaborative learning takes place in multi-organizational settings when social exchanges, defined as "voluntary actions of individuals that are motivated by the returns

they are expected to bring and typically in fact bring from others" (Blau, 1964, p. 91), are generalized and reciprocity is indirect. These expected benefits from voluntary actions become blurred in generalized social exchange since learning outcomes can be both individual and collective (Jones, et. al, 1998). Consequently, IO project participants are more uncertain regarding expected benefits and, as a result, are less inclined to contribute to collective learning processes. Even more, the incoherent nature of a generalized exchange structure in a multi-organizational project increases the risk of free-riding and lowers the incentive among project participants to, for example, share knowledge.

4.2 Aim and research question

In this paper, we combine work on multi-organizational projects (e.g., Das and Teng 2002) with work on interorganizational learning (e.g., Larsson et al., 1998; Knight 2002), and argue that there is a fundamental difference between dyadic and multi-organizational projects regarding collaborative learning due to generalized reciprocity between organizations within the IO project. The goal of this paper is to study these implications of the multi-organizational project setting for collaborative learning in order to strengthen the theoretical foundation for research on interorganizational learning. We answer the following research question: How does collaborative learning take place in multi-organizational project settings?

We contribute to the research on interorganizational learning by adopting a generalized social exchange-perspective (Das & Teng, 2002) and acknowledging the practice-based nature of learning

(Brown & Duguid, 2001). Our study aids in understanding why organizations pursue either a non-cooperative strategy aimed at their own interest or a cooperative strategy focused on the collective project interest (Leufkens & Noorderhaven, 2011) in response to learning tensions in multi-organizational projects (Larsson et al., 1998; Jones et. al, 1998). The study provides managers with a more solid insight into the processes that drive unique management challenges in multi-organizational projects.

4.3 Theoretical background

Social Exchange Theory: IO projects and indirect reciprocity

The roots of social exchange theory lay in sociology and social psychology with the work of, among others, Blau (1964) who defines social exchanges as "voluntary actions of individuals that are motivated by the returns they are expected to bring and typically in fact bring from others" (p. 91). Critique on social exchange theory, being too narrowly focused on interpersonal dyadic exchange relations originated early on (Emerson, 1976). Research culminated to extend social exchange theory beyond the dyadic focus and explored social exchange in interorganizational settings (Cook & Emerson, 1978; Levine & White, 1961; Cook & Whitmeyer, 1992). This academic effort is still developing from different fields, for example alliance literature (Garcia-Canal, Valdes-Llaneza & Arino, 2003) or group research (Moreland, 2010). The key notion, still, pertains to social exchange differences between dyadic and multi-party IO projects.

Das and Teng (2002) broadly define a multi-organizational project as "an arena in which members are involved in generalized social exchanges" (p. 446). However, building on the definition of Jones and Lichtenstein (2008) quoted in the first section of this paper; we define multi-organizational projects more precisely as three or more organizational actors from distinct organizations working jointly to create a tangible product/service in a limited period of time. In this view we can only speak of a multi-organizational project when the number of participants reaches three or more and, consequently, exchanges become generalized.

Ekeh (1974) states that social exchanges can be either restricted or generalized. In dyadic IO projects, only restricted social exchange takes place since a direct reciprocal connection between partners exist. When the number of participating organizations in an IO project reaches three or more, this social exchange becomes generalized and the correspondence between two exchanging parties to reciprocate is lacking. It should be noted that restricted social exchange can still take place in a multi-organizational project since dyadic exchanges, characterized by direct reciprocity, can occur in the multi-actor context. This is not only mentioned by Das and Teng (2002) but also by Hwang and Burgers (1997) who state that "any one observed relationship tends to be embedded in the larger context of additional influencing relationships [between project participants]" (p. 101). However, since multi-organizational projects are more than a collection of different dyadic relationships and require more coordination and collaboration as opposed to dyadic IO projects, the essential exchanges take place beyond dyadic relationships. Social exchanges, then, become generalized and Das

and Teng (2002) state that the subsequent norm of reciprocity becomes indirect, which constitutes "a group-based exchange relationship in which members expect quid pro quo exchanges within the group but not necessarily with any specific member" (p. 449).

This generalized reciprocity can be either chain-based or net-based[10] (Ekeh, 1974; Das & Teng, 2002). The difference lies in whether exchange takes place with one other project participant or with the group as a whole, although direct reciprocity is lacking with both types. With chain-based generalized reciprocity, social exchanges take place between single organizational actors within the IO project but reciprocation is not expected of the direct exchange partner. Thus, the most basic example would be a three-party project where actor A exchanges with B, B with C and C again with A. In this simple situation of generalized chain-based reciprocity, exchanges take place with one other participant, but reciprocation depends on another project participant.

With net-based generalized reciprocity, on the other hand, project participants do not exchange with one specific other participant but with the IO project group as a whole and in turn expect reciprocation from the group. So, in terms of the previous example of a three-party project, actor A contributes together with B and C to the collective efforts and in turn each project participant is reciprocated from the benefits of these collective efforts. Yamagishi & Cook (1993) nicely illustrate net-based generalized reciprocity with an example of a student dormitory: each student carries out some jobs to keep the

[10] These generalized reciprocity types have been referred to in different terms, for example Yamagishi and Cook (1993), who label these respectively network-generalized and group-generalized exchange.

shared kitchen clean. In return, every student in the dormitory benefits from a clean kitchen. Thus, exchanges and subsequent reciprocation are directed towards the group / collective effort (keeping the kitchen clean).

However, as this example already points toward, generalized reciprocity implies a free-rider problem: it is rational to not contribute to, and benefit from, a clean kitchen since a direct reciprocal relationship is lacking. Generalized social exchanges with indirect reciprocity (either chain- or net-based) constitute a learning dilemma in multi-organizational projects (Larsson et al, 1998; Yamagishi & Cook, 1993). We elaborate on this in the following section on collaborative learning in multi-organizational projects.

Collaborative Learning

Interorganizational learning has been broadly described by Mason & Leek (2008) as "the improvement of practices resulting from knowledge transfer among firms" (p. 775). This broad description points to the practice-based nature of interorganizational learning: collective creation and acquisition of knowledge among a set of organizations take place/is embedded in practice (Brown & Duguid, 2001; Huxham & Hibbert, 2008; Larsson et al., 1998). The present paper adopts this view that collaborative learning in multi-organizational projects is based in practices, i.e., "the way in which work gets done and […] knowledge is created" (Brown & Duguid, 2001, p. 200). The practice-based nature of learning takes the concept beyond the individual and stresses that "learning processes are intrinsically social and collective phenomena" (Teece et al., 1994, p. 15). In advocating the practice-based nature of learning, Brown

and Duguid (2001) also hint at the differences in practices that are likely to occur when projects are not executed in a single firm or a dyadic IO project but involve multiple and distinctive organizational actors: “Distinct practices create distinct embedding circumstances. Therefore, to understand where knowledge flows and where it sticks we need to ask where and why practices (and so embedding circumstances) are common, and where and why they are not” (p. 204). So, practices are the ‘carriers’ of interorganizational learning and a practice-based perspective might aid in understanding collaborative learning in a multi-organizational project setting where distinct practices exist across different organizations involved in the multi-organizational project.

Following Knight (2002), the key mechanism for learning in a multi-organizational setting is the interaction between project participants since “[c]ollective cognitive structures and coordinated practices cannot become established other than through relating across organizational boundaries” (p. 446). This question of “relating across organizational boundaries”, or collaborating in IO projects, becomes more complicated, as this paper argues, when the IO project setting is multi-organizational instead of dyadic due to social exchanges becoming generalized. The necessity of relating across organizational boundaries is also stressed by Gulati & Singh (1998) who argue that coordination costs arise from “interdependence of tasks across organizational boundaries and the related complexity of ongoing activities to be completed jointly or individually” (p. 781).

Summarizing, multi-organizational projects need to learn in and through collaboration[11]. As stated in the introduction of this paper, the stream of research in the learning literature focusing on collaboration as a tool for interorganizational learning emphasizes both collective knowledge creation as well as knowledge exchange between organizations in the IO project. Therefore, collaborative learning, learning *from* as well as *with* each other, is defined as the collective creation and exchange of collaboration knowledge among a set of organizations (based on Larsson et al., 1998, p. 287, emphasis added). This definition incorporates the collective feature of interorganizational learning and accounts for the creation as well as the exchange aspects of collaboration knowledge between project participants (Powell et al., 1996).

On the one hand, collective knowledge creation is the situation of learning with each other, in which IO project participants find new ways to interact and understand their collaboration. This is described by Larsson et al. (1998) as learning synergy or interaction effect which occurred as a result of the collaboration between organizations in the IO project. Collective exchange of knowledge, on the other hand, has been labeled by research in different but interrelated ways such as transfer, diffusion, flow or sharing of knowledge (Huxham & Hibbert, 2008). Exchange of knowledge refers to the situation of learning from each other, in which collaboration knowledge flows between organizations in the IO

[11] Related to the notion of learning and routines is the concept of recurrence as stated in Chapter Three. Please note that in this chapter we studied a single multi-organizational project therefore speaking of establishing *collaborative practices* whereas Chapter Five will look at two consecutive projects. As such, Chapter Five is able to look at recurrence and thus at *collaborative routines*.

project. Or, in other words, the process through which organizations exchange, receive and are influenced by the experience and collaboration knowledge of other participants in the IO project (van Wijk, Jansen & Lyles, 2008). However, collective knowledge creation and exchange are not mutually exclusive and features of one can be involved in the other (Hardy, Phillips, and Lawrence, 2003).

4.4 Methods

The principal aim of this paper is to strengthen the theoretical foundation for research on interorganizational learning. Therefore, we strive for an empirically grounded conceptualization (Glaser & Strauss, 1967) of collaborative learning in multi-organizational projects. Broad, open-ended questions were asked focusing on the internal organization and collaboration of the multi-organizational project along with the collaboration practices of the project participants. Guided by a social exchange perspective, the aim of the empirical study was to identify collective knowledge creation and exchange practices and subsequent reciprocity norms. Moreover, the study focused on what forms collaborative learning could take and what role reciprocity types play in collective creation and exchange of collaboration knowledge between the organizations participating in the IO project. Although the theoretical constructs of collaborative learning and generalized reciprocity provided the initial starting point of the data collection, the empirical study remained open for any issues that were mentioned by the interviewees or emerged from the observations.

4.4.1 Research design and setting

The empirical data for this study was gathered on a multi-organizational project in the Dutch shipbuilding industry concerning the construction of a large and complex vessel. The project involved a major Dutch shipyard and a range of subcontractors, each bringing their own expertise to the project. The project concerned a vessel which involved many different technical components and systems to be installed on board during both the slipway construction phase and the outfitting quay phase (project phases respectively taking place out of the water in the construction hall and in the water at the shipyards' dockside). A total of approximately twelve organizations were involved in the project, providing different resources and skills such as painting and conservation works, hydraulics, electrical installations, heating, ventilating and air conditioning, piping as well as classification authorities for commissioning the various parts and sections of the ship throughout the construction. This led to a "complexity of ongoing coordination of activities to be completed jointly or individually across organizational boundaries and […] difficulties associated with decomposing tasks and specifying a precise division of labor across partners in the alliance" (Gulati & Singh, 1998, p. 784) which required extensive collaboration between every organization in the IO project. This case was deemed appropriate since Dutch shipbuilding projects have to deal with a globalizing market and experience a high need for technical standards among firms, characteristics that Gomes-Casseres (1994) identifies as key for the rise in multi-organizational projects with generalized social exchange. The project was a so-called 'copy ship', indicating that the contract with the client followed the design of a

ship constructed earlier for the same client. This situation provided an opportunity to study collaborative learning within this IO project since the project participants had developed clear views and experiences about the matured collaboration process in this specific IO project. Although respondents frequently referred to the original vessel, reflexive or recall bias was kept to a minimum by asking each respondent how previous experience impacted current collaboration and reciprocity.

4.4.2 Data collection and analysis

Data were derived from interviews with project participants and observations of project meetings. The data was gathered over a one year period, from October 2011 until October 2012, during the two project phases mentioned above. In total, sixteen semi-structured interviews lasting, on average, 60 minutes were conducted. All interviews were audio-recorded and transcribed verbatim. Respondents were employed by the different organizations involved in the project; in this case the shipyard and the subcontractors. The observations included a total of 50 meetings and took place in four different types of meetings, focusing on the interaction between shipyard and subcontractors. The research process was iterative in nature, meaning that the observations served as input for the interviews, which, in turn, guided the observations. During the interviews, open-ended questions pertained to general topics related to collaboration, for example: “Are there ambiguities with regard to coordination? How are those solved?”, “with whom did you interact mostly?”, and “Where are improvements possible in the collaboration?” Respondents were asked on who they were

dependent and vice versa. Furthermore, interviews related to collaboration issues observed in the project meetings.

The starting point of our analysis was to identify initial collaboration constructs in the data from our observations and group them together into empirical observations. This open coding resulted in collaboration practices deployed by the shipyard and the subcontractors. After this phase, we started to construct second-order themes from these practices, which were collective knowledge creation and knowledge exchange practices. From this phase on, our interviews provided insight into our results from the observations. Our analysis went back and forth between observations and interviews, checking our different data sources against each other. In our axial coding, we identified norms of reciprocity among our categories, the learning practices of collaborative knowledge creation and exchange. We differentiated between net-based and chain-based types of reciprocity by asking our respondents from whom they expected reciprocation or whether it was clear who was supposed to reciprocate.

4.5 Findings

> *"Basically you're all working for the same thing. You try to deliver a ship with a good quality on time, as fast as possible to the customer. There happens a lot in the mean time." – Production manager mechanical engineering*

As this quote points out, the essence of shipbuilding projects lies in the collective goal of constructing and delivering a vessel to the customer. This research studies what happens 'in the mean time', how does collaborative learning take place in an interorganizational project that involves multiple actors? To fully grasp the meaning of the findings, it should be pointed out that collective knowledge creation and exchange of collaboration knowledge are studied in this case as learning from and with each other *on the operational level*. Thus, considering the construction of a complex vessel, collaborative learning looks in the meetings that were observed as follows:

> *"There's a plate on the funnel. It was more to the back at the other vessel because otherwise you would bash it while lowering the spuds. That was adapted back then but I don't see it yet on the drawings. I'm just pointing it out." – Electrical subcontractor*

This quote can be interpreted as an example of collaborative learning, or more specifically as an example of collective knowledge exchange since various participants in the project are influenced by the experience of, in this case, the electrical subcontractor who pointed out an unprocessed adaptation in the construction process

that did not directly pertain to his demarcation but, as he believed, was not correct. Below, the collaborative learning practices in the shipbuilding project are elaborated upon. Based on the theoretical framework, both collective knowledge creation and exchange are identified in the data. After that, the manifestations of, and implications from generalized reciprocity for these collaboration practices are discussed.

4.5.1 Collective knowledge creation and exchange in multi-organizational projects

The joint creation and exchange of collaboration knowledge among the organizations working on the vessel relates strongly to the technical complexity and interdependent nature of the tasks to be performed in a short time schedule. This was also indicated by both shipyard and subcontractors:

> *"It's a series of chains. If one chain breaks down everything moves over." – Production supervisor Shipyard*

> *"Pre-outfit time is often too short. Sometimes it's communicated like: guys, we keep the section a day longer on the floor. In that case we get, between brackets, a favor. But it is still too short." – Subcontractor*

These characteristics of the shipbuilding project led to, on the one hand, collective knowledge creation being important with regard to joint problem solving and coping with high technical complexity while, on the other hand, collective knowledge exchange being important

with regard to the strong interdependent and sequential nature of the activities to be performed.

As stated in the theoretical framework, collaboration knowledge exchange is important for coordination when practices differ across organizational boundaries. An example of this was observed in the meetings when one of the subcontractors was not satisfied with the fact that higher sections of the vessel were already placed and constructed while lower decks were not finished yet. This indicates that practice of construction order was not similar among project participants and collaborative knowledge exchange facilitates coordination:

> *"Where we can go up, we're going up and the rest keeps going. As it should be." – Shipyard production manager*

> *"So it's written down that they received our planning. We tell them our house rules, the do's and don'ts." Shipyard production manager*

Collaborative practices did not differ between all project participants. If practices or understandings of the collaboration were similar, collective knowledge exchange either already took place or was not necessary:

> *"So we drill a hole and weld a ridge. I know there are people how immediately need a blueprint or an additional order for that. I think it belongs to your job." – Piping subcontractor*

This statement shows how ideas about the collaboration and who is supposed to do what are similar, in this case, between the piping subcontractor and the shipyard but was not shared by other subcontractors. The importance of collective knowledge exchange in order to enhance collaboration and achieve shared collaborative practices was also stressed by a lead-engineer shipbuilding:

> *"Parochialism is no good to you, like: no, that's not my expertise and I have nothing to do with that. In such a case you're waiting on each other and you get delays and irritations. It's just no good."*

Collective knowledge creation resulted to be especially important for joint problem solving and coping with the high technical complexity of the vessel since it requires all project participants to collectively find new ways of interaction and understanding their collaboration. This was shown exemplary during one of the meetings in which subcontractor A had to consult with subcontractor B, C and a subdivision of the shipyard about who was doing what when since their operations were closely connected and the general plans were not sufficient for performing the interrelated tasks which converged basically at the same time in the same complex section of the vessel. After consideration, all parties agreed to a specific sequence of activities:

> *"I think we should work like this." – Subcontractor A*

The high technical complexity of the constructed vessel increased the need for collective knowledge creation since performing ones job independently does not suffice to get the IO project done. The efforts should add up to more than the sum of its parts, which is exactly the collective knowledge creation or what Larsson et. al, (1998) refer to as synergy:

> *"If we are asked when we are going to pull cables we indicate: on this or that moment are we ready. But still, the yard also needs to have taken some steps by then. Weld the caulks, weld the ribs, you name it. And we should have gotten the time to install the ducts. Everything is connected, everything is completely connected." – Electrical subcontractor*

As the quote indicates, besides technical complexity also interdependence drives the need for collective knowledge creation. Project participants need to collectively find ways of interaction since separate performances would cause otherwise unworkable conditions:

> *"If I have my pipes installed we're done. But that's not how it works, I also have to think about others […] you can get in each other's way but you have to deal longer with each other. I mind you and you mind me." – Subcontractor heating, ventilating & air conditioning*

Results from the interviews also showed collective knowledge creation with regard to information and communication. The

production manager mechanical engineering pointed to the synergistic effect of this:

> *"There are rather few things I wouldn't share because, and that's just my vision, the more you talk about it, the more answers you get and the more sides of the story you can shed some light on. If you know how to select from that, the sooner you know how things work."*

Moreover, this expectation of collective practice of communication and joint information sharing was also shown from the observations of the meetings:

> *"Which two pipes have to be installed yet?" – Subcontractor*
> *"We're here all together so someone should know." – Shipyard production manager*

More data supporting interpretations of collective knowledge creation and exchange in the shipbuilding project is shown in table six.

Table 6. Data supporting interpretations of collaborative learning

Theme	Representative quotes
Collective knowledge exchange	"Then we would be in the picture of the shipyard and you can't do that of course; we're also a subcontractor. The shipyard has the coordinating role, they have the overall view who is doing what, who has to deal with the painter or the piping firm. Everyone wants to do something so you definitely have to coordinate that." – Electrical subcontractor "It's also on blueprint: weld the ridges on highest and lowest points. Well, that should come from drawing office: go weld those ridges. But they are also people with a different view there." – Piping subcontractor "But it's of course a new vessel and you encounter new issues. Big issues are taken directly to the drawing office; I can call on them quite easily. But they want me to drop by with specific issues straight away. That works pretty well from both sides." – Lead engineer shipbuilding "Sometimes we get to a different area but mostly because we're it's asked for by the yard. It's an additional job we snatch." – Piping subcontractor "The subcontractors are contracted via purchasing

	and we have to make sure it becomes a workable situation. The starting dates when they can work on the sections, when we think it's responsible to start so you get a piece of collaboration like: when are you finished? Because we have to deliver that section on a certain time so you should be done by then. There's always a tension but a grey area? No, we get together every week so those grey areas are filtered out quickly." – Production supervisor shipyard "You should draw with the right settings right from the start. […] They shouldn't be changing things we don't know of, or vice versa. That we are changing things they're not aware of." - Project manager independent subdivision Shipyard "He doesn't know your house rules, he doesn't know his way around. So for a new party it's always more work to get them do their work right. For example X, he knows his way around, he goes straight to Engineering and solves a lot mutually." - Shipyard production manager
Collective knowledge Creation	"It's difficult because evaluations, of course you should do it, but it can only help for the next one. And you need everyone who was involved with the

	construction of the ship, to get is to be effective. And everyone should contribute of course." Electrical subcontractor "If the drawing office all of a sudden is starting to use new macro's or new construction parts, so to say, then we should be involved because we want everything one-on-one transferred to our production in order to get it on the slipway like the engineer imagined it." - Project manager independent subdivision Shipyard "Ships became more complex while construction got shortened although you need to install more and that needs time. You can only achieve that by staying in touch with each other and maintain good connections with everybody so everyone can do their jobs. At the right time, that's important of course." Electrical subcontractor "What I do notice, here at location A at least, is the idea: we're in this together. We expect that also in a way from our subcontractors. If they can act somewhere out of their scope in a better way than we can, we expect that more or less. There might be an additional order for it." - Production manager mechanical engineering

"You should get your own parts in there, in consultation witch each other of course because someone else should get his parts in there as well. So you consider: if I construct this then X and Y can't reach it anymore in a normal manner. So you shouldn't install it." Subcontractor heating, ventilating & air conditioning

"Every now and then its squeak and creak; you notice in the meetings: Oh, that's difficult, I need one and a half week. But the main problem is: they don't have a planning. We don't have a pre-outfit planning. Everything is discussed orally and collectively arranged." - Production manager construction shipyard

"Put the problems there where they're supposed to be and make sure in collaboration that it's solved. Make sure your main target is to perform your part and if there are influences from other fields, alright: take a look at it together and solve it collectively." – Lead engineer shipbuilding

"You have to deal with external people, you have to deal with the customer, you have to deal with the suppliers, you have to deal with commissioning

	offices, and, well, those interactions are good to work with. You know exactly what you're doing and where you need to be. That's something you of course built up over the years." – Lead engineer shipbuilding "The different disciplines have mutual interactions when something like, say, an electrical power station, needs to be installed. It's easier if it stands like this instead of like that. But if some connection needs to be attainable you can want it but it won't fly. So it happens when X or Y wants something but Z states: that won't work, you can't change it. So that mutual collaboration is very much present." – Production manager construction shipyard

4.5.2 Generalized social exchange and reciprocity in Dutch shipbuilding projects

As the first part of the results pointed out, collaborative learning can take different forms in a multi-organizational project. However, as stated in the theoretical section, one of the key characteristics of such a project is social exchanges becoming generalized when the number of participating organizations hits three or more. In the case of this shipbuilding project, around twelve organizations were involved in the construction and commissioning of the vessel. With closely-knit working relations and high technical complexity, many

social exchanges within the project of twelve organizations lacked a direct reciprocal relationship.

With regard to collective knowledge exchange driven by the sequential nature of tasks the data showed both chain-based and net-based reciprocity. Chain-based because organizations in the project are dependent on another and, in turn, are supposed to reciprocate with yet another organization in a sequential manner. Due to this chain-based reciprocity as opposed to a direct reciprocal relationship, participants in the project did not always reciprocate the social exchange of 'minding each other' in the different sections of the vessel:

> *"So you get needled to hurry and as soon as you're there, they're not even finished." - Subcontractor*

Also net-based reciprocity was observed in which an organization would expect reciprocation from the project as a whole. Since no participant was individually expected to reciprocate, this was sometimes lacking, as this subcontractor heating, ventilating and air conditioning stated:

> *"So I miss some ducts or something slipped through and they just continue construction, they don't look. One can see all the groove slots and nobody goes like: Euh, guys, don't we miss something here? That happens."*

Related to collective knowledge exchange based on the interdependence of tasks, a project manager of an independent subdivision of the shipyard which provided sheet metal parts to the production department for the construction of the ships' sections specified the importance of transparency as means to better understand each other collaborative practices:

> *"Of course, you cannot tell them everything, you're not going to introduce each and everyone around here but we are following a path of being as transparent as possible. Transparency has its advantage, if it comes from both sides, then we can even better gear our needs to each other."*

As this quote shows, transparency as a social exchange for enhancing collaboration should be reciprocated in order to provide full advantage. It was observed in the meetings that chain-based reciprocity caused transparency to be not always reciprocated since the production department had no reciprocal relationship with the metal sheet department whatsoever. Thus, transparency as a social exchange was observed in the shipbuilding project but only in a uni-directional way, lacking reciprocation.

Net-based reciprocity, in which the group as a whole reciprocates individual contributions, was found with regard to joint problem solving. Whenever problems occurred, every participant contributed to either solving or preventing the problems which mostly affects the next participant who was supposed to start his work in the area where the problems emerged. The net-based reciprocation in joint

problem preventing was pointed out by the subcontractor heating, ventilating and air conditioning:

> *"You watch each other of course like: guys watch it, you should isolate, and you should now paint otherwise you can't reach it anymore. That's how we collectively try to keep up."*

A similar reasoning applied to the collective knowledge creation in response to the high technical complexity of the constructed vessel. Participants acknowledged each other expertise and jointly reciprocated in a chain-based manner this social exchange of alerting one another:

> *"If there are any questions from which I think: take care, this is mechanical engineering or this is electrical equipment, I throw it back because it's not my expertise. I believe that, although I have some knowledge about it, you always discuss it with the others. So: watch it; this has something to do with mechanical engineering so you have to warn the boys. That happens and luckily it happens also the other way around." – Production manager mechanical engineering*

Project participants were well aware of the problems that might arise when reciprocation was lacking, for example with regard to the interdependent nature of tasks:

> *"But we should first put the idea on the table: this is what we want and then see what the possibilities are. If one little chain*

doesn't cooperate, it becomes immediately a problem." - Project manager independent subdivision Shipyard

Much of the social exchanges and subsequent generalized reciprocities related to information sharing and communication. On many occasions during the project, information was shared and communication took place in a reciprocal manner, as the lead engineer shipbuilding pointed out when talking about processing changes in the drawings throughout the project:

"I get the idea that things are running smoothly now: I get informed like, pay attention to this or that. And we ourselves also inform the slipway office or the production department."

However, examples were found in which reciprocation was lacking:

"If I ask you a question and you get back with me I expect you did some research and don't rashly give me an answer like: it can't be done" – Lead Engineer Shipbuilding

This quote refers to a situation in which one participant contributed to the project in a chain-based manner by answering questions in a well supported way. However, since asking questions seldom goes bi-directional, reciprocation was either lacking or insufficient. Or in other words: I give well supported answers to your questions and expect you to give well supported answers to someone else's questions in return. This generalized reciprocity was also observed in a net-based type in which participants did not react to information since no one

was individually expected to reciprocate. This resulted in information not being used or delayed:

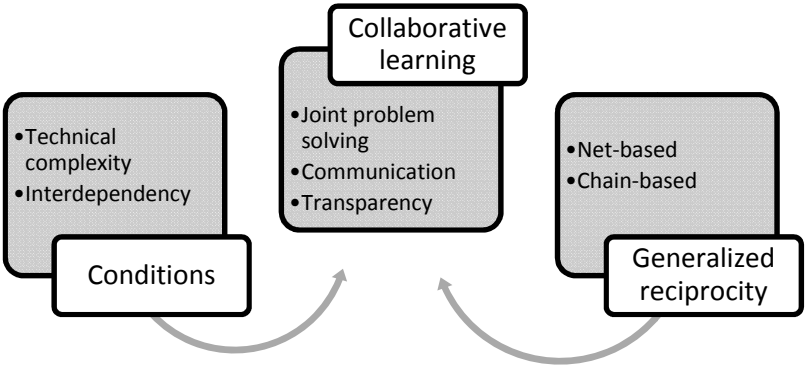
> *"If X sends a warranty point to someone and you don't think it's your responsibility then at least send it back so it doesn't get put aside" - Project manager*

4.6 Conclusion and discussion

In this paper, we combine work on multi-organizational projects (e.g., Das and Teng 2002) with work on interorganizational learning (e.g., Larsson et al., 1998; Knight 2002), and argue that there is a fundamental difference between dyadic and multi-organizational projects regarding collaborative learning due to generalized reciprocity between organizations within the IO project. The goal of this paper was to study implications of the multi-organizational project setting, characterized by indirect reciprocity, for collaborative learning in order to strengthen the theoretical foundation for research on interorganizational learning. The research question that guided the study was: how does collaborative learning take place in multi-organizational project settings? In a case study on the construction of a large, complex vessel both chain-based and net-based types of generalized reciprocity were found with regard to collective knowledge creation and exchange. Given that collaborative knowledge creation is a collective effort in which multiple actors have to contribute knowledge together in an open manner it was found that net-based generalized reciprocity influences the knowledge creation effort. Net-based exchange systems include both individual

and collective outcomes (Jones et. al, 1998) making it more difficult to assess whether each party gains fair reciprocity from the group as a whole. Due to this lack of transparency, actors contributed less to the knowledge creation effort since appropriate returns had a higher uncertainty. For collaborative knowledge exchange, chain-based generalized reciprocity manifested itself since flow of collaboration knowledge between participating organizations involved exchange of knowledge with another participant while not expecting reciprocation from that specific participant. Also, project conditions of high technical complexity and interdependency of tasks were found to be increasing the need for respectively collective knowledge creation and knowledge exchange. These conditions and reciprocity types of collaborative learning within a multi-organizational project are summarized in figure three.

Figure 3. Conditions and practices of collaborative learning in multi-organizational projects.



This study contributes to the literature on interorganizational learning by adopting a generalized social exchange perspective (Das & Teng, 2002) and acknowledges the practice-based nature of learning (Brown & Duguid, 2001). It shows how task related conditions of the IO project drive the need for collaborative knowledge creation and exchange and in addition illustrates how these collaborative practices take place under influence of different types of generalized reciprocity.

4.6.1 Limitations and directions for future research

Although this specific shipbuilding case is exemplary for many types of industrial IO construction projects, transferability of the results of this study to less specific contexts should be done with caution. Furthermore, it should be noted that reciprocation takes place in a certain time frame which can take for one organization too long while being considered timely by another organization in the IO project.

Especially in IO projects which are characterized by high time pressure, this notion might have distorted the findings. Research which deepens the understanding of reciprocation and studies the role of temporariness in multi-organizational projects looks promising and paves the way for scholarly interest on project participant characteristics in interorganizational learning.

Since research on the distinction between dyadic and multi-organizational projects and the subsequent implications of the reciprocity types for collaborative learning is emergent, this study serves as a first step towards a better understanding of interorganizational learning in multi-organizational projects. The assumption that dyadic or multi-organizational projects represent the same learning practices and processes causes project management to study project learning inadequately. More empirical studies that bind classical concepts such as social exchanges and practices to new avenues of research on interorganizational learning or reciprocal attitudes will advance project management literature and practice.

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Chapter 5

Network Learning across Multi-organizational Projects

5.1 Introduction

In the face of globalizing, increasingly demanding markets and rapidly changing technologies, organizations in today's economy progressively rely on multi-organizational projects. This is especially the case with complex products and systems which are often executed through multi-organizational projects due to their complexity (Hobday, 2000). Building on the definition of Jones and Lichtenstein (2008), we define multi-organizational projects as three or more organizational actors from distinct organizations working jointly to create a tangible product/service in a limited period of time. If organizations need to collaborate in multi-organizational projects for the delivery of complex products and systems, an important element of the collaboration is to learn how to coordinate these types of temporary collaborations. However, literature on coordination in multi-organizational projects is limited (Bechky, 2006; Janowicz-Panjaitan, Bakker & Kenis, 2009). So far, the established view on coordination has been that faced with high environmental and task uncertainty, organizations shift from formal structures to interpersonal, more informal, mechanisms of coordination (March & Simon, 1958; Galbraith, 1973). With regard to temporary collaborations this coordination argument has been applied in that temporary collaborations depend, for example, on 'swift trust' as interpersonal coordination mechanism (Meyerson, Weick & Kramer, 1996). Although temporary collaborations, due to their temporary nature may lack the formal structures of coordination found in non-temporary organizations, "they have both industry structures and emergent practices that coordinate and control activity" (Bechky, 2006: 5). Beyond such very general conjectures, however, we have

little knowledge of how coordination in multi-organizational projects takes place and evolves over time. Given the increasing prominence of such projects, as well as the mounting evidence that coordination often falls short (Gulati & Singh, 1998; Srikanth & Puranam, 2011; Gulati, Puranam, & Tushman, 2012), the question how organizations collectively learn to coordinate multi-organizational projects over time is now more pertinent than ever.

If organizations collaborate repeatedly in projects together, this opens up the possibility of learning to coordinate their activities together more effectively, as a group. If this is the case network learning as proposed by Knight (2002) takes place. Network learning is learning by a group of organizations, *as a group;* thus stressing the collective nature of coordination across multi-organizational projects[12]. The key element of network learning pertains to the distinction between the learning entity and the learning context (Knight, 2002; Knight & Pye, 2005). Differentiating between the learner and the learning context shows that much of the prior work on interorganizational learning is concerned with learning by individual organizations within interorganizational networks, but not learning by interorganizational networks[13]. Even in the recent upsurge of attention for interorganizational learning, the unit of analysis remains the individual organization (Larsson et al., 1998) and not the network as such (Knight, 2002).

[12] Please note that in Chapter Three we conceptually explored the development of coordination through collaborative routines which we will study empirically in the present chapter, focusing on network learning which emphasize the collective nature of collaborative routines.

[13] We elaborate on the interorganizational learning literature and the concept of network learning in the theory section.

Shifting the unit of analysis from the individual organization to the network level (Larsson et al., 1998; Knight, 2002) allows us to explore learning by groups of organizations across multi-organizational projects. This paper argues that a network-level focus on coordination in multi-organizational projects is important since in such a context the quality of complex products and systems depends on the productive integration of skills and resources rarely found in single organizations (Gann & Salter, 2000). Learning to better coordinate a multi-organizational project requires a collective effort among participating organizations (Larsson et. al., 1998), making network learning a suitable concept to study multi-organizational project coordination.

However, although Knight (2002) introduced the concept of network learning, its features need to be further articulated, and the concept also still needs to be made empirically tractable. In our empirical case we propose that network learning has taken place from project one to project two if project-level coordination problems witnessed in project one have been solved on project two. By doing so, we follow Knight and Pye's (2005: 371) suggestion that "changing network-level properties, such as shared practices and processes, would indicate network learning".

The aim of this paper is to increase our understanding of how organizations as a group can learn to improve their coordination from one project to the other, i.e., how network learning regarding coordination takes place. To date, research on coordination across multi-organizational projects is limited and empirical insights on network learning are lacking. The paper therefore answers the following research question:

How does network learning take place across subsequent temporary multi-organizational projects?

The paper adds to the literature on temporary organizations by gaining insight in coordination of multi-organizational projects. Moreover, the paper contributes to the learning literature in general and to the studies of Knight (2002; Knight & Pye, 2005) in particular by showing how multi-organizational projects can function as learning entities as opposed to only being a context for learning. Its practical contribution lies in the potential of network learning for guiding strategic action of multiple organizations. Providing insights in how organizations collectively learn will foster a transformation to a learning network, i.e., a set of organizations that deliberate and purposefully learn across multi-organizational projects as a group.

This paper proceeds as follows: first, we will discuss network learning and coordination in multi-organizational projects. Next, we present our research context: two consecutive, highly similar temporary multi-organizational projects in the Dutch shipbuilding industry. Due to their similarity, these projects form a highly appropriate context to study network learning. We provide a brief narrative of these two projects, and describe our coding and analysis processes.

In the subsequent sections we present our findings, pertaining to coordination practices which are either improved or unimproved across the two consecutive projects. Based on this we theorize about the occurrence of network learning as well as the forms it may take and the conditions under which it is realized. We end with

conclusions, limitations, and recommendations for future research to advance our understanding of network learning.

5.2 Theory

5.2.1 Network learning

Knight (2002: 427) introduces the concept of network learning as "learning by a group of organizations, as a group" which pertains to more than the cumulative learning of individuals, groups and organizations within the network. She sets network learning apart from related but distinct concepts like interorganizational learning and learning networks. Interorganizational learning is mainly concerned with individual, group and organizational learning within an interorganizational setting whereas learning networks are multiple organizations with the sole purpose of learning, for example the knowledge-sharing network of Toyota (Dyer & Nobeoka, 2000). However, as Knight (2002: 435) argues: "little of the research on interorganizational learning or learning networks addresses network learning; the authors tend not to focus upon the network as learner, but on the network as the context for learning".

Learning in interorganizational collaborations has gained considerable scholarly attention in recent years (Larsson et al., 1998; Hibbert & Huxham, 2005; Huxham & Hibbert, 2008). Nevertheless, although concepts of individual, group and organizational learning in collaborative settings are well developed, empirical work on network

learning[14] is scarce and theoretical insights are scattered (Gerlak & Heikkila, 2011; Knight, 2002; White, 2008).

Although network learning is a phenomenon that needs to be distinguished from learning at the organizational or individual levels, it does need to be seen in connection with these other levels: "just as organizational learning does not occur in isolation of individual learning, so network learning and organizational learning are closely interlinked" (Knight, 2002: 446). This indicates that different levels of learning can take place within a network but in order to speak of network learning, the multiple organizations constituting the network should change the group's behavior and/or shared cognitions through their interactions. Otherwise, change to for example organizational level properties in the context of the network would indicate organizational learning and not network learning.

Consequently, investigating network learning constitutes a significant challenge, described by Knight and Pye (2004) as a tension between change and learning. Much of what is observed in a network might as well be regarded as change. Building on work on organizational learning, it becomes clear that the relationship between learning and change is problematic: both concepts are used interchangeably throughout the literature obstructing a clear understanding of learning (Fiol & Lyles, 1985). Extending the work on organizational learning to the network level, Knight and Pye (2004) argue that 'learning' offers richer insights on what happens in temporary

[14] Network learning has sometimes been referred to as 'collective learning' or 'social learning' but we believe these terms to be related but not the same since the term network learning implies foremost an interorganizational network-level focus.

collaborations such as multi-organizational projects than ‘change’. Learning is closely linked to, but not the same as, change.

So what constitutes network learning? Knight (2002) applies the most commonly used distinctions from the organizational learning literature, being learning outcomes and processes on the one hand and cognitive and behavioral change on the other (Fiol & Lyles, 1985; Crossan et al., 1995). She states that network learning takes place through network learning outcomes and network learning processes: the former defined as changes pertaining to network-level characteristics, either cognitive, behavioral or both, and the latter pertaining to how these outcomes are produced (Knight 2002; Knight & Pye, 2005).

Network learning outcomes can thus be traced through either cognitive change, behavioral change or a combination of these two. When no change to network-level properties is observed it can be argued that no learning has occurred, i.e., no network learning because no change occurs within the network. In order to speak of network learning outcomes, observed change, whether it is behavioral, cognitive or both, should concern the network as such. Thus, for example, behavioral change at the network level concerns network-wide practices and cognitive change concerns network-wide shared interpretations and norms.

Figure 4. Typology of network learning outcomes: based on Knight (2002) and Crossan et al, (1995).

		Network-wide interpretations and norms?	
		No	**Yes**
Network-wide practices?	**No**	No network learning	Cognitive network learning
	Yes	Behavioral network learning	Integrative network learning

Network learning processes pertain to how network learning outcomes are produced and are based on the interaction between network members since "collective cognitive structures and coordinated practices cannot become established other than through relating across organizational boundaries" (Knight, 2002: 446). Studying processes involves by definition "a sequence of events or activities that describes how things change over time" (Van de Ven, 1992: 170).

Empirical work on network learning so far remains scarce. Knight (2002) developed the concept of network learning and empirically studied it in the English prosthetics service (Knight & Pye, 2004; 2005). The network learning concept of Knight and Pye has only empirically been followed up by White (2008) in a case study on a multi-agency social services initiative in a south London area. However, his case is better characterized as an example of a

learning network, i.e. a network with the purpose of learning, since the network was specifically aimed to reach out to certain socially isolated groups in south London which the network was not able to reach out to before. Thus the network was designed solely with this specific goal to learn.

Another empirical application of network learning is the study of Gerlak and Heikkila (2011) on the Florida Everglades restoration program, consisting of multiple organizations collaboratively restoring the Everglades ecosystem. Although these authors follow in many aspects the construct of network learning as set out by Knight (2002), they do not specifically make clear whether we can speak of network learning. Their program-wide survey reported 'learning products' but it remains unclear how these products came about. So although they distinguish between learning products and process these authors identify program outcomes as network learning products but tend to refrain from specifying how these outcomes came about through network learning processes.

Summarizing, network learning is constituted by network learning outcomes and processes. Outcomes relate to behavioral and/or cognitive change at the network level; processes to interaction between actors in the multi-organizational project producing network learning outcomes. However, the question how network learning takes place goes at least from an empirically standpoint unanswered.

5.2.2 Improved Coordination of multi-organizational projects as a form of network learning

We define multi-organizational projects as projects in which three or more organizational actors from distinct organizations working jointly

to create a tangible product or service in a limited period of time. This definition of a multi-organizational project is based on Jones and Lichtenstein (2008) but refined to refer to three or more actors, based on the multi-actor argument of Das and Teng (2002). This argument implies a fundamental difference between dyadic and multi-organizational projects: social exchange between actors becomes generalized when the number of actors in temporary collaborations reaches three or higher. This is considered to be important for coordination of multi-organizational projects since coordination constitutes a dynamic social process characterized by exchanges between actors (Jarzabkowski, Le & Feldman, 2012).

Research on network learning tends to distinguish between the context of learning and the learning entity but by doing so neglects to delineate what the object of learning is. We will focus on a specific aspect of network learning, namely learning to coordinate the network. Coordination in our study refers to "the process of interaction that integrates a collective set of interdependent tasks" (Okhuysen & Bechky, 2009: 463). Although our understanding of coordination in multi-organizational projects is limited (Bechky, 2006) it is generally agreed upon that temporary collaborations rely more heavily on social mechanisms such as reciprocity and socialization under exchange conditions of uncertainty and complexity (Jones, Hesterly & Borgatti, 1997). Thus, in the case of multi-organizational projects delivering complex products and systems coordination does not depend on a single organization via formal systems and hierarchical lines but is a collective effort under conditions of environmental uncertainty and task complexity. As such, coordination of a multi-organizational project relates to collective

action and mutual adjustment between participating organizations and needs to be learned collectively (Larsson et al., 1998; Knight, 2002).

While many generic categories and strategies of coordination are proposed in the literature on coordination (see for example the review of Okhuysen & Bechky, 2009), what actually entails coordination practices is far less specified. Nevertheless, basic elements of coordination found in the literature are *planning and adaptation* (March & Simon, 1958; Thompson, 1967), *communication* (Kogut & Zander, 1996; Heath & Staudenmayer, 2000) and to a lesser extent *problem-solving* (Marengo & Dosi, 2005). These coordination practices have their origins in research on organizational coordination and design but are particularly relevant when coordinating a complex task between multiple actors involves social interaction and high interdependence across organizational boundaries (Gulati et. al, 2012).

5.3 Methods

We conducted an in-depth case study (Yin, 1994) of two consecutive shipbuilding projects. Since these two multi-organizational projects concern the same task (construction of duplicate vessels) and are performed by the same network members, this empirical case constitutes a nearly perfect opportunity to study network learning. Our primary object of analysis is whether and how network learning with regard to coordination took place from the first of the two multi-organizational projects to the second. The focus of inquiry here is at

the set of organizations collectively learning to better coordinate the two multi-organizational projects.

5.3.1 Research context

Projects in the shipbuilding industry frequently involve multiple organizations such as shipyards, clients, classification authorities, and a wide range of specialized subcontractors. Shipbuilding projects vary between unique 'one-off' vessels at one extreme to (mostly small) series of nearly identical vessels on the other (series ranging from two vessels to even standardized stock-build vessels). The two multi-organizational projects in the current study are an example of the latter: they were the final two from a batch of three vessels constructed for the same client.

Such a series of (almost) identical shipbuilding projects, if executed by mostly the same group of companies, offers extensive network learning opportunities, making this an attractive context for our study. The subcontractors (N=12) involved in the construction of the three identical but complex vessels had to tender for the entire series. The first vessel of the series was constructed by the same subcontractors but at a different shipyard site. Therefore, the final two vessels were chosen as object of study because these were constructed on the same site of the shipyard and therefore provide the most similar context. Thus, the two key multi-organizational projects in this paper included the same subcontractors engaged at the same shipyard site in the construction of technically identical vessels. We will refer to these two shipbuilding projects as 'D1' and 'D2'.

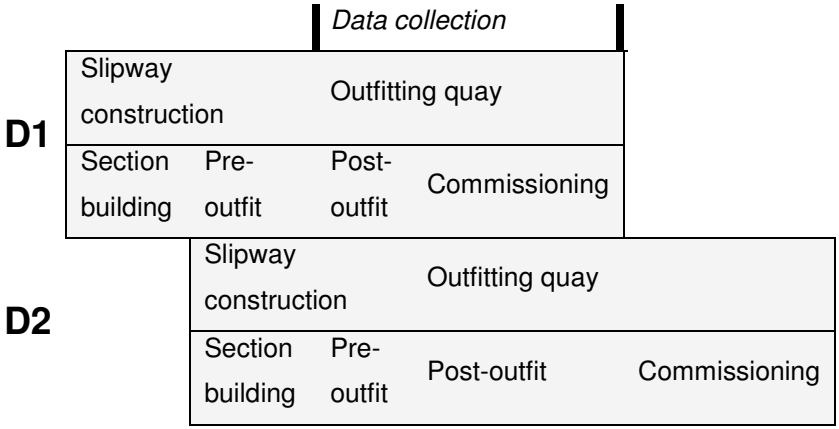
These type of vessels are used for excavation of sediments underwater and can be seen as complex products and systems (Hobday, 2000) since they are characterized by a relatively high degree of technical complexity. For example, installing and powering the massive pumps as part of the dredging system while also installing and powering the general systems to operate the vessel constitutes a major technical challenge. Even more, these different systems are linked and have to be installed in a limited amount of time by diverse organizations in the limited space on board. These characteristics require mutual adaptation and close interaction between organizations involved in the project, in order to accomplish the large set of interdependent tasks. These requirements reflect a high need to improve the coordination which the organizations in the project collectively need to learn. This makes for an attractive empirical context for the study of network learning across multi-organizational projects. Relevant project participants from the shipbuilding industry indicate the existence of so-called 'copy effects', i.e., the execution of repeated multi-organizational projects tends to become more effective and efficient over time. This implies that learning, at whichever level, took place and offers a practitioner-driven impetus to study network learning in this setting.

The construction process of a vessel can be roughly divided into the slipway phase and the outfitting quay phase. During the slipway phase the hull of the vessel is constructed into so-called sections and erected on the slipway and the subcontractors pre-outfit different sections of the vessel with components related to their respective expertise, for example power cables, air ducts and hydraulic pipes

and valves. After the slipway phase the vessel is launched and enters the outfitting quay phase in which the vessel is further outfitted in the water. During the outfitting phase all the different components from the pre-outfit phase are further connected and main systems of the vessel are started such as bilge water or main engines.

The execution of the two projects partly overlaps in time, as can be seen in figure two. During the data collection, one project was in the slipway construction phase and the other project in the outfitting quay phase. We expect this close coupling of the activities of the two projects in time to enhance learning opportunities since participants had the opportunity to implement learning possibilities during the time of data collection, again making this an attractive context for our study. An overview of the construction phases of the two multi-organizational projects is provided in figure five.

Figure 5. Construction phases for the two shipbuilding projects



5.3.2 Data collection and analysis

The first author conducted non-participant observations during two types of construction meetings for both projects. These two types of construction meetings were 'pre-outfit meetings' and 'post-course meetings' and showed the interface between representatives of the different organizations involved in the projects as opposed to, for example, 'pre-course meetings' in which only representatives of the shipyard attended. These meetings served as suitable observations since the actual coordination of D1 and D2 took place here.

The observations were done through an observation protocol aimed at coordination practices and involved taking descriptive and reflexive notes; this was done in order to disentangle respectively the objective events taking place in the meetings and the subjective interpretation of the researcher at that time. The data collection was completed by conducting ten interviews with key respondents employed by the different organizations involved in the two shipbuilding projects. The interviews lasted on average 60 minutes and were all audio-recorded and transcribed verbatim. The interviews were guided by a semi-structured interview protocol focusing on key coordination aspects of shipbuilding projects which included the coordination practices of planning, adaptation, communication and problem-solving as described in the theory section. An overview of the data is depicted in table seven.

Table 7. Data overview chapter five

Data	D1	D2
Observations	45	68
Interviews	10	

The data analysis is based on a recursive, interpretative template of Harrison and Corley (2011) suited for answering 'how'-questions. In our case the question was how network learning on coordination takes place across subsequent multi-organizational projects. Considering this focus on network learning directed at coordination of the multi-organizational projects we followed a two-step approach: the first step was searching for coordination practices in the data. The second step involved searching for network learning with regard to these coordination practices of step one. The recursive nature lies in switching between the different data sources (the observations and the interviews) and between step one and step two of the research approach (searching for coordination practices and searching for network learning).

Step one is primarily based on data from the observations of interactions between project participants in construction meetings. However, also data from the interviews was used whenever coordination-related concepts emerged from the data. Based on these observational and interview data we searched for initial concepts in the data related to coordination of the multi-organizational project (open coding). Although this open coding was guided by the coordination practices formulated in the theory section,

we remained open to other coordination practices that might emerge from the data.

Step two of our analysis is primarily based on interviews with key respondents employed by the different organizations involved in D1 and D2. However, also observational data was used if it could be of value in understanding network learning processes. The aim of this second step is to gain an understanding of the processes which constitute network learning with regard to the coordination practices identified in the previous step. Events are considered appropriate methodological tools since processes in multi-organizational projects are inherently relational, involving multiple actors; are temporal embedded and related to a specific context in which they take place (Pentland, 1999; Halinen & Tornroos, 2005). Therefore, key events are used to search for and illustrate the processes which constitute network learning concerning the coordination practices identified in the previous step. We take a constructivist perspective on events as social constructions which are sensitive to contextual and temporal factors (Halinen, Tornroos & Elo, 2013). This means that events indicate the various views of respondents on what happened from D1 to D2. We combined these various meanings attributed to events by the respondents into themes (axial coding). Through the focal lens of events we were able to grasp a full understanding of how network learning of coordination took place across the two shipbuilding projects.

5.4 Findings

5.4.1 Coordinating D1 and D2

The analysis revolved around coordination of D1 and D2 and how the set of organizations involved in these two shipbuilding projects collectively learnt to do so. Before we identify coordination practices or even search for network learning processes, a brief case description is presented.

During data collection, D1 was at the outfitting quay in the post-course and commissioning phases. During post-course all the installed parts from the pre-outfit phase on the slipway are finished and connected. This phase overlaps with the commissioning phase in which all the components (e.g. dredge pumps and switchboards) and systems (e.g. hydraulics, auxiliary power) are checked and approved. If components are finished, they can be commissioned. D1 was experienced by the actors as a relatively problematic shipbuilding project with lots of issues regarding coordination and technical complexity. One of the subcontractors was running behind schedule significantly in comparison to the other actors, which had a great impact on overall coordination since activities of the various organizations are highly interrelated. Besides frustration and a stronger focus on organizational self-interest among the other actors, this lagging behind also created technical issues since key activities such as installing and commissioning the main engines or purifying the hydraulic systems had to be either postponed or speeded up. Even more, sea-trials, which is a key milestone in a shipbuilding project where the newly build vessel goes to open sea to test all its systems, were delayed. For example, during sea trials the suction

pipe and drag head are tested and the engines and pumps are run on full capacity to detect possible flaws.
D2 was during data collection in the pre-outfit phase on the slipway where various subcontractors pre-install their components and materials. The vessel was launched and entered the post-course phase at the outfitting quay where the subcontractors and shipyard continued with their pre-installed parts. Compared to D1, the actors experienced D2 as a major improvement since everyone was keeping up the collective pace, resulting in less damage to each other's work and tackling many technical issues beforehand. This even enabled meeting the management's decision to shorten slipway time for D2 by four weeks, which is significant according to shipbuilding norms. A tremendous amount of work is expected to be done in a rather small period of time. The majority of activities to be performed on board are a matter of hours and days rather than weeks or months. In part as a consequence of the time pressure these two shipbuilding projects can be characterized as highly complex.

Step one of our research consisted of searching for coordination practices of planning, adaptation, communication and problem-solving. In addition, we extracted from the data the practice of pacing, an aspect of coordination we had not identified ex ante. These coordination practices and subsequent examples on D1 and D2 are shown in table two.

Planning concerns the mapping and adjustment of different, interdependent activities performed by the shipyard and the various

subcontractors. Through various types of construction meetings, informal communication between actors and with the use of project-wide planning tools and schemas it is established who has to do what when. Planning concerns mainly when and in what order specific spaces in the vessel will be released to specific actors. For example, only after a specific room on board has been conserved by the painter can another organization start with isolation of pipes installed by yet another organization. The issue of planning as an aspect of coordination is driven by the highly interdependent nature of these projects, as is clearly described by an electrical subcontractor:

> *"A nice example is the bridge. The ship is launched without the bridge. One deck below is all the equipment for the bridge, all of the automation is in there. That thing has to be placed, positioned, welded, grinded, painted, isolated, and then I come in. And all that in just four weeks. So I counted back and said: I'm not going to say we can't make it but it is going to be a challenge. And what do you see? We were all in each other's way but we were able to sit around the table and say: you start, then I come in, then you go out so you can go in and that's how we got it done. So you see it works as long as you communicate."*

As this quote points out, many of the activities that needed to be planned were highly interdependent and involved more than three actors. It was observed in the construction meetings that although the official schedules were drawn up by the shipyard, the final

planning involved much negotiation between all the actors involved about how much time was scheduled for every activity.
The importance of planning was especially visible in what was often mentioned by respondents as 'respecting each other's work'. Especially on D1 it frequently happened that work already done was damaged by poorly planned subsequent activities of other parties. This problem was mentioned by one of the subcontractors in a construction meeting:

> *"In front of the engine, on port side, there are still two valves missing. We are hesitant about installing those due to possible damaging".*

Adaptation pertains to one party adjusting its activities on the project for the sake of other parties on a voluntarily basis and before these activities became critical in the construction process. This willingness of project participants to make operational adjustments before matters became urgent was on D1 relatively low among the different organizations due to irritation about one party running behind, decreasing overall adaptation. However, on D2 adaptation was relatively high because that specific party was not lagging behind anymore. An example of adaptation is given by the electrical subcontractor:

> *"Perhaps you can remember it from the previous vessel; we painted the foundations for the switchboard cabinets. Perhaps it is a bit premature but I'm just pointing it out for the painter. If*

we paint those again this time then the cabinets can be installed and everyone can continue".

This is an example of adaptation since the electrical subcontractor proposes to take on additional work which does not pertain to his contracted work (painting foundations) but benefits the overall project ('everyone can continue'). Although we also found dyadic adaptation, i.e. one actor adjusting for the sake of one other actor, the majority of adaptations that we observed pertained to three or more actors which was to be expected taking the highly interrelated nature of the work on board into account.

Communication involves sending and receiving project information as well as communicating with other actors. Communication is an overarching coordination practice of which traces can be found in all other coordination practices. For example, communication was based on pre-established relationships between actors and facilitated problem-solving when encountered issues require interaction and information exchange between multiple actors:

"What people discuss at the work floor is often essential for progress. That they find each other in case of problems and that they ask if someone can remove a pipe, that an air duct is obstructing, or if pulling cables can be postponed. They coordinate that mutually and we are not always present but that happens if you work with the same subcontractors every time: they know each other and they know how to find one

another. The structures are already there." - Production commissioning coordinator

Furthermore, on D2 communication became more frequent, pro-active (i.e. before specific activities became critical) and was shared among all actors, as indicated by one of the piping subcontractors when being asked how communication took place:

"In the beginning it was quite tough but after that we didn't have much trouble with other parties. It just went well. If something was asked it got done and if there were problems we sat around the table and it got solved".

Problem Solving encompasses finding solutions for encountered problems involving three or more actors. Problem solving on D1 took much effort and time whereas on D2 problems were dealt with more effectively. In addition to the problem solving example of the 'technical space' in both vessels displayed in table two below, another example was the pump room on board as described by the production commissioning coordinator:

"With the pump room we have this corner that is just really annoying. You see that people at some point start contacting each other: 'if you have your brackets then I will already start isolating so you install your pipes. That took me a lot of time last time', or: 'I couldn't reach it anymore back then with painting'. People do know that".

On the one hand this quote shows once again the planning issue which we described above. There, actors in the network mutually come up with a collective planning. However, the important part of this quote is that actors anticipated problems by gathering the involved actors to tackle potential problems. The issue of problem solving involved often three or more actors since problems on board mainly arose in technically complex spaces such as the engine or pump room. In these types of spaces multiple actors had to perform their work often simultaneously. Gathering the involved actors for tackling problems was facilitated by the more enduring relationships between actors:

> *"The more projects you do together, the more people get to know one another. So people know: well, I have this problem so I go to him. With this problem I have to see those guys. And that's mutual of course. And if there's a problem you get together at the table and come to a consensus. So you see a change there" – Project manager*

This quote shows that after several projects actors learn about each other, which facilitates problem solving and communication. This experience-based learning across projects pertained to knowing who to go to with what problem. It also included how to solve those problems among each other.

Pacing is a coordination practice which emerged from the data. This practice is closely related to planning but emphasizes the temporary and sequential nature of shipbuilding projects. Pacing as a

coordination practice refers to the specific speed and rhythm with which activities on board are performed. This practice is based on the highly interdependent and sequential nature of shipbuilding. On D1:

> *"There were a few subcontractors that weren't doing really well. And they pull everyone down. If certain pipes have to be done at a certain time and they aren't done; well, I come after and I have to finish it so my time window is getting smaller" – Isolation Subcontractor*

If a disruption of the pacing on a shipbuilding project is not appropriately resolved it trickles down the construction process, creating friction between actors and becoming a collective issue as presented by the production commissioning coordinator:

> *"It creates problems in the sense that people cannot continue. They are here with ten guys and another party isn't ready so you get friction. They start like: I can only deploy five guys but I'm here with ten! So they start pushing to get things done. That's what happens when one party lags behind. Everything is interrelated: you can't isolate if the pipes haven't been connected. So it takes coordination or all other parties will start pushing of course".*

Table 8. Coordination practices with examples on D1 and D2

Coordination Practices	Example D1	Example D2
Planning	Preservation of the exhaust pipes of the emergency generator set has not been done before being installed.	Exhaust pipes are preserved before installation (adjustment between painter, yard and piping company).
Adaptation	Air conditioning unit had to be removed in order to paint the floor. Much discussion among actors since it involved much extra work.	When requested, section of the hull was timely 'put on tubs' i.e., lifting the section by the shipyard so electrical and piping subcontractors can more easily perform their work on the section.
Communication	The isolation subcontractor and the painter are often the last actors involved in a task; they were informed on status updates and decisions by other actors in the project in a reactive	Isolation subcontractor and painter were involved and consulted before other actors initiated their work in a particular area on the vessel, often face to face on board or in the construction meetings.

	fashion, decreasing possible mutual adjustment.	
Problem Solving	A certain compartment in the vessel, the 'technical space', constituted a major challenge since many actors had to work in this technically complex compartment in relatively the same time frame. This resulted in many discussions during the meetings.	Electrical subcontractor, painter and isolation subcontractor addressed the issue of the technical space beforehand, coming up with a specific approach on who was supposed to do what when so issues from D1 could be avoided.
Pacing	One of the actors severely lagged behind in comparison with the others. This caused many delays, irritation, and extra work throughout the project among several actors.	All actors operated collectively and simultaneously. Exemplary is that many actors already started their work on sections of the vessel even before the specific sections were released for pre-outfit.

The majority of the respondents indicated a so-called “copy effect” with D2, signifying that some type of learning had taken place. This copy effect was illustrated by the project leader Production of the shipyard when he compared the two vessels:

> *“I see on board that everything is way further than with the last one although slipway time was shortened. So everything fits together way better. People know how things work and issues they ran into last time are better handled now. I think you can clearly see the copy effect on this vessel”*

Executing repeated projects more effective over time is referred to by respondents as a ‘copy effect’. The project manager gave the following reason for the observed increase in efficiency:

> *“Knowing what should be done. You’ve got two vessels after one another so you know what should be done and with whom. The monkey learnt a trick”*

Supporting this perceived copy effect, an actual improvement from D2 compared to D1 is observed. Although both projects were delivered within budget and contractual delivery time; total man hours spend on D2 were three per cent less compared with the man hours needed for D1. Furthermore, D2 experienced less warranty issues compared to D1. Altogether, this implicates that the network learnt to coordinate their activities together more effectively, as a group.

5.4.2 Searching for network learning processes

> *"It's a voyage of discovery, you see that when you collectively shift gears and adjust, that it improves and that it meets the expectations of the customer"*

As this quote of the project manager illustrates, there is an overall impression of network learning when organizations involved in the shipbuilding projects 'collectively shift gears' leading to improvement of coordination and better meeting expectations of the customer. Our analysis brings the specifics of this network learning to the light. But what entails network learning regarding coordination in our research setting? A brief example would be the following: a department of the shipyard coordinates the scaffolding on board which is used by all actors involved in the projects. This scaffolding is basically constructed and reconstructed at various locations throughout the vessel by another subcontractor depending on which activities are scheduled at that time. On D1 the requests of subcontractors for scaffolding in specific areas took much time and communication whereas on D2 relatively less time and communication was needed for getting scaffolding at the right time in the right place. Thus, although the construction of scaffolding in itself did not much change from D1 to D2, the way in which it came about did: the actors in the network adapted to each other's way of collaborating and scaffolding was collectively coordinated with more effective communication and less loss of time. This example can be considered network learning because the group of organizations changed their collective practice of, in this case, constructing scaffolding. Since network learning and

the way in which it comes about is strongly context dependent, two events are presented to show how network learning regarding coordination took place from D1 to D2.

Event 1: 'Hick-ups'

As presented in the case description, D1 experienced many operational problems related to technical complexities of the task and subsequent interdependence of activities between actors. On D2, in contrast, operational problems were significant less frequent and had less impact as their predecessors on D1:

> *"Things that went wrong on [D1] appear just way better on [D2]. So it is much better handled by everybody" – Production Commissioning Coordinator*

Adequately responding to encountered problems is a key element of coordination and organizations involved in both projects had to find a collective way of responding to encountered problems due to the interrelatedness of the activities to be performed on board. This collective nature of problem solving on D2 was pointed out by the construction supervisor:

> *"The advantage of a duplicate vessel is that everyone can anticipate the problems way sooner. We try to avoid each other on those points where we hindered each other before".*

The most prominent manifestation of the suboptimal problem solving on D1 were the collective responses to the operational problems

created by the piping subcontractor that severely lagged behind on schedule. This delay caused several operational issues such as postponing the commissioning of certain components or the deconstruction of already installed parts by other subcontractors since key activities were behind schedule. Instead of adequately responding to those operational problems, the group of organizations displayed frustration, a stronger emphasis on self-interest and a qualitative decline in communication. The production commissioning coordinator presented the friction between actors when being asked what the consequences were of someone falling behind:

> *"It creates problems in the sense that people cannot continue. They are here with ten guys and another party isn't ready so you get friction. They start like: I can only deploy five guys but I'm here with ten! So they start pushing to get things done. That's what happens when one party lags behind. Everything is interrelated: you can't isolate if the pipes haven't been connected. So it takes coordination and other parties will push of course".*

This pushing by actors was related to a stronger emphasis on self-interest as explained by one of the subcontractors:

> *"You try to take care of yourself as best as possible of course. For everyone is their own progress the most important. If your work is delayed it is costing you money. Or hours actually: if you cannot continue for a day with four men it's already thirty-two hours. That adds up"*

In such a situation where project planning is under pressure and actors stronger pursue self-interest, the need for communication increases for appropriate coordination of activities. However, on D1 the quality of communication declined:

> *"You know what the thing is? As soon as things don't run smooth those guys like commissioners and fitters don't tell you anything anymore. Only when you're finished: 'yeah, you forgot that'. Now they bring problems to you in advance, like, pay attention to this or that. If you can install this than we can commission it" – Piping subcontractor*

One party lagging behind in the project network decreased overall network behavior of other actors adjusting to one another. It was also observed in the construction meetings that this behavior was shared among all actors and not only in a dyadic relation with the actor that was lagging behind but towards all actors whenever operational problems occurred.

Problem solving, and consequences of self-interest and deteriorated communication on D1, was better handled on D2. Although the task of constructing D2 involved similar technical complexities and interdependence of activities as on D1, problems were anticipated by the group of organizations much earlier and were dealt with in a more effective manner. This change in coordination practice of problem solving was primarily attributed to a much timelier and appropriate way of communicating:

"The bottlenecks are known which makes people know how to find one another faster and more willing to say: I will already isolate that part because it was really hard to reach last time so you can go on with your piping and everything can be painted afterwards. You really see a significant learning effect on a duplicate vessel" – Production commissioning coordinator.

This shift in communication between actors from D1 to D2 indicates a change from a practice of low trust and safeguarding to one of high trust and anticipation. This is described by one of the piping subcontractors as follows when being asked why he stopped documenting communications on D2:

"If something happens you can always say: 'look, it is discussed here and it hasn't been done'. But now we are at a stage in which you know everyone well enough to be sure that when you ask something it will be done" – Piping subcontractor

The issue of self-interest was also dealt with through improved communication. For example, the shipyard tried to keep time slots appointed to various actors as short as possible in light of project deadlines whereas various actors in the project tried to maximize available time for their work. When this happened, consultation among the involved actors had to provide a compromise to accommodate both organizational and project interests on D2:

"Together we have to build a really nice vessel which should be launched and delivered to the customer on time. That's the first thing that counts but after that, well, everyone fights of course only for his own patch. If those clashes you consult with each other and come to an agreement" – Construction supervisor Shipyard

Event 2: 'Speeding Up'

Bearing in mind the construction phases for the two shipbuilding projects depicted in figure two, the next event pertains to the slipway construction phase of D2. The shipyards' management decided that slipway time for D2 was reduced by four weeks for reasons related to the slipway schedule for succeeding projects. Although this event took place on D2 it showed the learning curve since many respondents argued that such a decision could not have been made on D1. As presented in the case description of D2, four weeks constitutes a significant period of time according to norms in the shipbuilding industry. Reducing slipway time from the original planning thus required improved coordination of D2 compared to D1. All actors involved needed to collectively "shift gears" in order to make up for the four weeks which they accomplished, directed by the construction department of the shipyard and with a collective pace:

"Everyone was aware of the four weeks reduction in slipway time and although no one liked it of course we firmly emphasized that objective and everyone could pick up very well on that. Together we constructed a really nice vessel, four

weeks shorter on the slipway" – Construction supervisor shipyard

How did the group of organizations accomplish to improve their coordination practices so that slipway time was reduced by four weeks? In short, this was accomplished through activation on D2 of informal interaction based on a latent network of ties between the actors in combination with a collective awareness of what needed to be done and how.

Informal interaction in the project network was not as common on D1 as it was on D2. During construction meetings, the informal interaction was especially visible in the actors' communication, as stated by one of the piping subcontractors:

"If you get along well with the boys, you regularly have a cup of coffee with each other and some chatting then you accomplish much more altogether. You're way more willing to help. Half of the things aren't even in the minutes of the meetings anymore; we deal with those among each other".

This quote indicates that the increased informal interaction observed on D2 is based on the underlying network of ties: actors in the project 'know each other and how to find one another'. Thus, the basis for their collaboration is already present. The more underlying relationships within the project network underlie both shipbuilding projects since the same set of actors were involved. These more enduring relationships between actors facilitated not only an increase on D2 of informal interaction but also spurred collective awareness of

what needed to be done. This collective awareness can be described as a shared understanding of who was responsible for what. Although this network of ties was to a lesser extent already present on D1, it was activated on D2 by the decision to shorten slipway time. This latent network was observed in the meetings: It happened on D2 more frequently than on D1 that actors who were not involved in a certain activity on board did mention which actors should be involved when this was not immediately clear. This reaffirms the statement of the project manager that the copy effect includes collectively 'knowing what should be done'. This collective awareness on D2 was also described by the construction supervisor of the shipyard:

> *"I think with less communication it does work out more efficiently because everyone understands what the other is supposed to do"*

Summarizing, through informal interaction based on their latent network of ties and an increased collective awareness of what needed to be done led the group of organizations to reduce slipway time of D2 by four weeks. With regard to planning in general, we could observe that these changes in interaction and awareness took place from D1 to D2 and were implemented by all organizations involved. During the second project:

> *"We sat around the table with all parties involved and we made a plan. We stuck to it and learned from it: we have to do it differently on the next vessel to create more time. We will get*

a similar scenario in which we have to schedule really sharply after one another so people don't get in each other's way because that room is just too small. And we implemented that now". – Electrical subcontractor

As this quote shows, network learning arose from purposive efforts to learn and improve project performance. This network learning process was not a smooth transition, or as one of the subcontractors remarked when being asked how he saw the changes in coordination on D2:

"I would almost say: with trial and error; the example of [D1] and how we actually don't want it. Everyone realizes that"

Table 9. Data supporting interpretations of network learning

Data supporting interpretations of network learning	
Label	Representative quotations
Copy Effect	"[D2] is a repetition on the same shipyard site, you can see an increase in efficiency which is unprecedented" – Electrical subcontractor "Things that went wrong on [D1] appear just way better on [D2]. So it is much better handled by everybody" – Production Commissioning Coordinator "I can see a learning curve between the two ships and you can see that it runs more smoothly with me also. Of course we had some conflicts and it should be because we are trying to stand with a hundred men at a couple of square meters but you can see that it runs more smoothly." – Electrical subcontractor
Communication	"Talking, informing. Look, if someone is fed up with it I can say he has to do something but it is better if I do it myself. For the greater good so to say. Now that there isn't any holdup, things are running more smooth as compared to the previous one" – Project leader Production "There is currently better communication among

	each other. Like I said, we are willing to do something for another. If something is being asked just immediately act upon it or just report back, like: this is done. That just went way better on [D2], straight from the beginning" – Piping subcontractor "You know on the second boat where the bottlenecks are, everyone knows. And everyone asks each other: 'can you do that first? Then I can start on that spot already'. It is just perfect if you can agree on that with each other. And that isn't even done in the meetings but mutually discussed, also with the shipyard". – Isolation Subcontractor
Problem Anticipation	"Now we try as much as possible, knowing and learning from [D1], to stay ahead. So we do know where the bottle necks are and we can act upon that by saying: let's do this now quickly so we won't get bothered later where parts have to be removed" – Piping Subcontractor "On [D2] you basically have the problems from [D1] in the back of your mind. So in principle you know where the bottlenecks are and you're trying to solve those problems in an early stage. That works a lot easier". – Subdivision Shipyard

	"Well, we don't always see that. That mutual adjustment happens for the larger part outside. Because there is a critical success factor: that people look for each other whenever there are problems" – Production commissioning coordinator "We knew to arrange it with others in such a way that we all could continue and that's what you want. You want to diminish surprises and above all that your people can continue." – Electrical subcontractor
Collective Awareness	"I notice that things are more calmly at the meetings as compared to [D1]. Especially now everyone is keeping pace. You just notice that things are more calmly and people think before they do something". – Piping Subcontractor "I didn't think people realize [D1] was really going south and they're now really focused on [D2]. It is basically falling down and getting back up. That's the question: how long will that awareness reside? Or will everyone lean back, thinking it will be alright. Will that focus stay until the end of the project?"

	"After the first ship everybody is tuned in and knows what to expect even though it isn't correct. But you know what to expect so the second one goes easier. Doesn't says it goes right, but it goes easier" – Project manager
Informal Interaction	"I have a very good relationship with [X] and with [Y], I know those boys. So if something is in my way it is discussed like that. That doesn't always have to be in a meeting. We discuss that among each other and it is removed for us. Just be flexible and everyone can work nicely, everyone can move on" – Piping subcontractor "It works easier if you can approach people directly who want to do something for you instead of going through the formal channel. Because then, well, forget it" – Project manager "A lot is discussed outside the meetings. Especially with regard to [D2] in which you can see more of the flexibility reappearing" – Hydraulics subcontractor
Latent network of ties	"The team that works here is really adjusted to each other. We barely have to say something and the others know what you mean. If I do this then you will do that, which almost happens automatically. We work together for years

	already. Every now and then a new one comes or somebody leaves but the overall group is relatively constant. You do notice that" – Project leader production "In 99 per cent of the cases the spoke persons remain the same only the one doing the work changes. When the spoke persons change everything really takes a turn but that is not the case at the moment" – Project manager

5.5 Discussion and Conclusions

The purpose of this paper was to increase our understanding of how network learning regarding coordination takes place. We studied two consecutive projects in the Dutch shipbuilding industry to answer our research question: how does network learning take place across subsequent multi-organizational projects? We showed how a group of organizations participating in the construction of complex vessels collectively improved their coordination practices from one project to another. Firstly, we presented coordination practices of planning, adaptation, communication, problem solving and pacing taking place on D1 and D2. Second, two events of network learning outcomes were presented, respectively improved problem solving ('Hick-ups') and improved pacing ('Speeding up'). The results showed how problem solving improved from D1 to D2 through network learning processes of communication and collective problem anticipation whereas improved pacing was achieved through collective

awareness and informal interaction based on a latent network of ties between actors. Although we presented two events in which network learning regarding coordination took place, we also observed frustration between actors, a stronger emphasis on self-interest and deteriorated communication impeding coordination and network learning.

As stated in the beginning, the paper contributes on the one hand to the literature on temporary organizations and on the other hand to the learning literature. Although our understanding of coordination of multi-organizational projects is limited, this study shows how coordination takes place through practices of joint planning, adaptation, communication, problem solving and pacing. Even more, we showed how these coordination practices of a group of organizations changed from one project to another. The first four coordination practices were grounded in the literature on coordination, the fifth coordination practice of pacing emerged from the data. By this theoretical and empirical combination we made a first step in advancing our understanding of coordination in multi-organizational settings and how this can look in a context of complex products and systems.

A second contribution lies in empirically advancing the study of network learning. Although the studies of Knight and colleagues (Knight, 2002; Knight & Pye, 2005) make the case for distinguishing between the learning context and entity, this study argues to also include the object of learning. Thus far, the object of learning is not addressed in the emergent literature on network learning. This makes the concept difficult to understand and study since the network level is a higher level of learning as compared to the

individual, group and organizational levels. Especially higher levels of learning benefit from specifying the object of learning since these are harder to visualize. By focusing on coordination as a core issue in multi-organizational projects, we could show how network learning took place from D1 to D2. Furthermore, this paper shows that the distinction between learning outcomes and processes is empirically less clear cut as conceptually. In event two 'speeding up', the reduction in slipway time of D2 was not only conceptually a network learning outcome but empirically preceded the network learning process by deciding the reduction by four weeks beforehand.

Another contribution regarding network learning concerns first steps towards a network learning theory. In light of our results, we are able to propose two factors influencing network learning: task complexity and network composition.

First, task complexity is likely to influence network learning since a complex task requires a certain degree of interaction between network actors in order to accomplish the task at hand, increasing the need for network learning. However, when the collective task is too complex, network learning becomes obsolete since application of the network learning is unlikely in the future. In our case, the incentives to engage in network learning were obviously present since the group of actors knew beforehand that similar complex vessels were to be constructed.

Second, network composition, i.e. the group of participating organizations, is likely to be of importance in maintaining network learning. In order to keep network learning going, a network seems to need some 'fuel', either in the form of new knowledge or new actors. Either way, when a network of organizations repeatedly

interacts without new actors joining or new knowledge contributed by already participating actors, network learning is likely to dry up in the face of a repetitive task or a network of familiar yet rigid ties.

A practical contribution relate to the idea of a learning network, involving deliberate and purposeful learning as a group of organizations. Considering the important role of an underlying network of ties among actors for network learning in our research setting, organizations gathering in a multi-organizational context might take into account the configurational aspect at the start of a project or activities to build such a latent network of ties during a project.

5.5.1 Limitations and recommendations for future research

There are a few limitations to our study which point at opportunities for future research. Given our research design we could not assess whether observed changes to coordination practices were enduring and persistent over time. We could only account for changes across the two shipbuilding projects. It would require a longer time frame to study the persistence of the observed changes. This would also only be possible if the same set of organizations would continue to work together on identical (or very similar) projects, which is rare in the shipbuilding industry. Although we were not able to study whether observed changes were persistent over time, we deem future research from a longitudinal nature very helpful in separating network learning from network change.

Although we specifically focused on network learning thus, by definition, pertaining to network-level practices, it is also possible that additional learning in the context of the multi-organizational project

has occurred, but on a level other than the network level. For example, if an organization unilaterally alters it way of collaborating with others in the project, this does not involve more than three actors nor does it involve network-level properties. Thus, it would be organizational learning in a multi-organizational context at best. Extending the recommendations of Knight (2002), future research focusing on possible interplays between various levels of learning within the same context will aid in understanding the notion of network learning.

Another limitation pertains to our research setting. As stated in our method section, D1 and D2 were part of a batch of three identical but complex vessels. Although the first vessel of the series was constructed at a different shipyard site, there is a potential of network learning for the actors present on the first vessel which falls outside of our data collection window (see figure 2). Although we were not able to account for a possible network learning effect from D0 to D1, we believe that our results concerning the network learning from D1 to D2 still hold given that the larger part of the network already had a learning opportunity on D0 and network learning was still observed from D1 to D2.

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Chapter 6

Commissioning the vessel: conclusions

6.1 Introduction

We constructed the hull of this dissertation in the introduction chapter by presenting the Dutch shipbuilding industry as our research context since temporary organizational forms are predominantly the mode of organization used in this sector. We argued that there were two gaps in the literature on temporary organizational forms: on the one hand the scant research attention for interorganizational projects in general and multi-organizational projects in particular and on the other hand the lack of understanding about coordinating these multi-organizational projects under the condition of high task complexity.

In this concluding chapter, we will commission the vessel that this dissertation has become and see what concluding cargo it holds. After summarizing and integrating the main findings of the chapters, we discuss the contributions this dissertation makes to the literature on temporary organizational forms. Furthermore, practical implications for the Dutch shipbuilding industry are formulated followed by the limitations and a discussion on future research opportunities.

6.1.1 Summary of conclusions

Chapter 2: Continuity and change

Following Engwall (2003), interorganizational projects and their practices are not independent 'islands' in a sea of projects, but history and context dependent. Chapter Two addresses the history-dependent nature of interorganizational projects showing the development of project practices and demands over time. In this empirical chapter it was argued that part of interorganizational project practices and demands are currently not aligned. This partial

misalignment was based on the premise of the actors in the Dutch shipbuilding industry. Informed by our data from retired and current active employees in the Dutch shipbuilding industry, we could identify continuity in some practices and change in others by looking at practices that did not fit contemporary project demands. We gave path-dependent explanations for this misfit, concluding that self-reinforcing mechanisms were at play and that historical developments were partly the cause for the contemporary misfit between practices and demands in Dutch shipbuilding projects. We circumvented the static and a-historical stance of contingency theory by combining it with a path dependency theoretical perspective. Our findings showed that the theoretically proposed mechanisms which trigger path dependence indeed empirically are at play in the studied interorganizational project setting and explain lock-in situations and the succeeding misfit. Much empirical research on path dependence neglects to show such details on reinforcing mechanisms (Vergne & Durand, 2010). Even more, we argued that these mechanisms are at play in an interrelated manner rather than in isolation. Next to this, we showed that path dependence can be generalized to an interorganizational context whereas much of the research on path dependence pertains to organizations rather than goal-directed temporary networks of organizations. This chapter shows the problematic issues that might arise in temporary interorganizational projects with regard to collective practices and coordination. As such it forms an empirical foundation for the formulation of the research problem which is deepened in the following chapters.

Chapter 3: Collaborative routines

Whereas Chapter Two empirically elaborated on the history dependent nature of interorganizational projects; Chapter Three theoretically explores if and how coordination routines on the interorganizational level might develop. By doing so we made collective action in project ventures more explicit, providing input for Chapter Four and Five. The goal of this theoretical chapter was to explore how coordination routines aimed at collaboration can emerge in interorganizational projects. We did so by building on insights from the capabilities and practices literatures on routines and relating these to the interorganizational project dimensions of context, time, task, and team. Interorganizational coordination routines were defined as "relatively stable patterns of interaction among three or more firms aimed at coordination and refined in the course of repeated collaborations" (Based on Zollo, Reuer, and Singh, 2002). Interorganizational coordination routines are vital to the success of interorganizational projects since regular and structured coordination mechanisms such as a formal hierarchy are less prevalent when organizations are functionally interdependent but legally autonomous. We identified several antecedents for the emergence of interorganizational coordination routines, which can be found in table ten below. Our results show that interorganizational projects theoretically can have different antecedents, which can be expected to have divergent effects on the emergence of IO coordination routines. Aiming for and refining these coordination routines is likely to be difficult, requiring commitment of all actors involved in the IO project.

Table 10. Antecedents of IO coordination routines

	Antecedents of IO coordination routines	Expected effect on formation of IO coordination routines
Context	Temporal embeddedness	+
	Organizational embeddedness	+
Time	Duration	+
	Pressure	-
	Synchronization	+
Task	Complexity	-
	Uniqueness	-
	Interpretation	+
Team	Surface-level diversity	∩
	Deep-level diversity	-
	Size	-

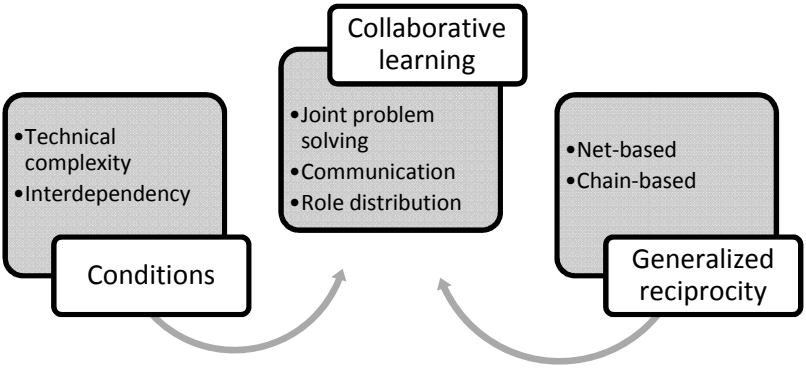
Chapter 4: Quid Pro Quo

Building on the notion of interorganizational routines from Chapter Three, this empirical chapter applies the notion of collaborative practices in addressing the multi-actor issue in inter-organizational collaboration, with the aim of exploring when generalized reciprocity between participating actors will arise. Chapter Four showed that social exchanges with regard to collaborative learning become generalized in multi-organizational projects as opposed to what happens in dyadic projects. We distinguished between collaborative knowledge creation and exchange as aspects of collaborative learning, and found both chain-based and net-based types of

generalized reciprocity in a case study of a large and complex vessel. Second, we showed how the task conditions of a multi-organizational project influence collaborative learning by participating actors in terms of knowledge creation and exchange.

On the one hand, we found that knowledge creation is a collective effort of the actors in the multi-organizational project which made reciprocity from the group as a whole harder to observe for the participants. It was found that this lack of transparency caused the actors to contribute less to the knowledge creation effort. On the other hand, we found that collaborative knowledge exchange was characterized by chain-based generalized reciprocity since actors had to exchange collaboration knowledge between each other while not expecting direct reciprocation for their effort from that exchanging actor. In addition, we found that high technical project complexity and task interdependency increased the need for collaborative learning. These findings are summarized in figure six below.

Figure 6. Conditions and practices of collaborative learning in multi-organizational projects.



Chapter 5: Network learning

This chapter studied how network learning about coordination took place on two consecutive multi-organizational projects in the Dutch shipbuilding industry. Network learning in this chapter pertains to learning *as a group* how to coordinate multi-organizational projects better over time. This chapter looks across projects, whereas Chapter Four studied collaborative learning of collaborative practices within a single multi-organizational project. Chapter Five extends the notion of a collective learning effort by the group of participating organizations from within a single project venture to understanding network learning across multi-organizational projects. As such, Chapter Five addresses the issue of coordination in multi-organizational projects beyond the 'lonely project' (Engwall, 2003).

By focusing on inter-organizational coordination practices of planning, adaptation, communication, problem solving and pacing we

showed how the group of organizations involved in the construction of two complex vessels collectively learnt to coordinate these temporary multi-organizational projects better.

We studied two events to analyze how coordination practices improved from the first to the second project. First, the group of organizations managed to improve their collective problem solving through network learning processes of communication and collective problem anticipation. Second, the group of organizations improved their pacing via collective awareness and informal interaction which was based on a latent network of ties between the actors. Although our events point out instances in which network learning regarding coordination indeed did happen, we also found evidence of a stronger emphasis on self-interest and deteriorated communication between actors which hampered network learning.

6.2 Contributions: coordinating multi-organizational projects

The research problem addressed in this dissertation implies that our knowledge and understanding of how coordination takes place in multi-organizational projects was scarce, as most of scientific attention is directed at intra-organizational coordination. With one conceptual and three empirical studies we shed light on this issue by addressing the path-dependent aspects of interorganizational collaboration and coordination (Chapter Two), the emergence of routines related to coordination (Chapter Three), the multi-actor implications for collaborative learning (Chapter Four), and learning to coordinate on a network level (Chapter Five).

Chapter Two, addressing the path dependent nature of project practices, showed how history influences coordination of interorganizational projects in the present and as such provided the temporal foundation for the other chapters, which focus more on single projects, or on two consecutive projects. This chapter combined contingency theory, which assumes that organizations in changing environments regain fit by changing practices, with path dependence theory which explains how changing practices might lead to creating or sustaining misfit between project practices and project demands. We have shown how interorganizational project practices changed over time in a direction that does not correspond to the evolving project demands. Project practices changing in such a counter-intuitive direction ultimately lead to a lock-in situation; a process we called path dependent adaptation. This process signifies a moderating effect of path dependency in contingency theory, meaning that lock-in ultimately prevents regaining fit.

Chapter Three elaborated on the notion of coordination routines on an interorganizational level. This third, conceptual chapter systematically analyzed the emergence of interorganizational coordination routines and by doing so we fortified the interorganizational routine literature by pointing out some if its shortcomings, such as its strong focus on knowledge sharing routines. By using the capabilities and practice perspectives in combination with the interorganizational routine literature we were able to go beyond the organizational level of routines. We explored the enduring nature of temporary interorganizational collaborations, not only with regard to the actors involved but specifically towards

the task at hand. This is especially relevant given the increasing prevalence of interorganizational projects.

Chapter Four returns to the notion of interorganizational routines discussed in Chapter Three and address this phenomenon in a multi-actor context. This conceptual chapter sheds light on coordination within multi-organizational projects, whereas Chapter Five looks at coordination across multi-organizational projects. This conceptual chapter contributed to the literature on interorganizational learning by acknowledging that learning is rooted in practices (Brown & Duguid, 2001), while showing how generalized reciprocity impacts on social exchanges taking place in the multi-organizational project. By focusing on generalized reciprocity in an empirical context we started to explore implications of multi-organizational projects for coordination and collaboration which has not been done so far with regard to learning, especially collaborative learning. By specifically addressing the multi-actor nature, typical for the sector under study, as opposed to dyadic interorganizational projects we contributed to the advancement of the temporary organization literature in addressing these differences in temporary interorganizational settings and their implications for temporary organizing.

Chapter Five also applies the notion of interorganizational routines from Chapter Three for the purpose of studying network learning. Chapter Five provides empirical insights into coordination across multi-organizational projects, whereas Chapter Four focused on coordination within such temporary endeavors. Chapter Five contributed to the temporary organization literature and the learning literature. We advanced our limited understanding of coordination of multi-organizational projects through analyzing coordination

practices of a group of organizations from one project to another. We also advanced the emergent literature on network learning by showing the relevance of the object of learning in addition to the distinction between the learning context and learning entity (Knight, 2002; Knight & Pye, 2005).

Taken together, this dissertation offers an encompassing exploration of how coordination of multi-organizational projects takes place, positioned within the temporary organization literature, learning literature, and network literature.

6.3 Practical implications

Back in the days when the shipbuilding industry became more global and a fierce cost competition emerged, the demand for cargo vessels and bulk carriers decreased tremendously. The Dutch shipbuilding industry focused effectively on niche markets and established a global market leader position for specialized dredging vessels and mega luxury yachts. Nevertheless, the shipbuilding market remains volatile nowadays with strong global competition, facing ever stronger challenges with upcoming players and mounting rules and regulations, but also offering innovative opportunities such as deep sea mining, which sets new requirements to vessels and equipment. What can the organizations in the Dutch shipbuilding industry in general and the participants of the innovation program in particular learn from the studies in this dissertation? Building on the conclusions of the different chapters we can frame managerial

recommendations which might aid in improving the present suboptimal collaboration in Dutch shipbuilding projects.

An important cause of the persistent suboptimal collaboration in the Dutch shipbuilding industry lays in the interrelatedness, both between project practices and between path dependence mechanisms. As is shown in Chapter Two, interrelated mechanisms underlying project practices create complementarity effects; one reinforcing the other. This explains why certain practices developed in a direction counter to what one would expect in light of contemporary project demands. Implication from this finding is that managers of shipbuilding projects should display 'historical awareness', realizing the historical development and background of project practices. Addressing causes of misfit in the project one after another will likely not be effective due to the interrelatedness of path dependence mechanisms underlying this misfit. Instead, managers should aim at addressing these issues simultaneously, or at least treat the misfit from a holistic perspective. In addition, not only the underlying path dependence mechanisms are related but the project practices also. Thus, changing one practice will likely not be successful without changing other related practices.

In addition to the historical influences on changing project practices, managers of shipbuilding projects might find value in our overview of antecedents and their expected effect on the emergence of interorganizational routines (see Chapter Three). Not only understanding the historical effects on their current project activities but also the influence of other aspects such as, among others, task complexity or time pressure will prove valuable in managing the

various interdependent activities to be performed on board a ship under construction. Making sure routines are established/formed on an interorganizational level is essential to accomplish the task at hand with legally independent but functionally interdependent organizations.

Our first two studies provide project managers with a more solid understanding of the task and time dimension (Lundin & Soderholm, 1995) whereas our third study (Chapter Four) elaborates on the inter-organizational project team dimension, showing the implications of a multi-actor setting. Understanding the implications of generalized reciprocity within the multi-organizational project will aid project managers in facilitating the collaborative learning process and making sure all organizations involved keep contributing to this process. To this end, project managers might think about ways of acknowledging individual contributions to the project more explicitly, increasing participants' confidence to reciprocate. Doing so will facilitate the display of reciprocal attitudes of project participants.

Chapter Five builds on the team and context dimension of temporary organizations, suggesting that the group of organizations involved in the multi-organizational project might become a learning network, i.e. a network with the sole purpose of learning. Our results indicated an important role for the underlying network of ties among actors. Project managers might aim at building such a network of ties among the actors at the start of the project with kick-off meetings. Such meetings already took place at the start of the shipbuilding projects studied for this dissertation but these meetings primarily focused at the functional, task-related aspects of the project. Our suggestion is to focus these meetings also on the more informal, relational aspects

of the multi-organizational project such as participants' expectations towards each other about the project or history of previous conducted projects so as to set norms and create a sense of familiarity.

6.4 Limitations and directions for future research

The studies in this dissertation present some limitations which, however, also suggest interesting directions for future research. From those various limitations in the different chapters we were able to aggregate two main sets of limitations: one pertaining to the methods applied and one pertaining to the generalizability of the results.

First, although we utilized a multi-method approach to study coordination in the multi-organizational setting of the Dutch shipbuilding, some problems still need to be solved. For example, in Chapter Two we relied on subjective, oral sources to discover path-dependent explanations for the contemporary misfit in shipbuilding projects. However, this made it fairly difficult to objectively conclude whether the observed misfit was indeed prone to path dependence or not. In a similar fashion, it was difficult to assess in Chapter Five whether changes to coordination practices that we observed in the two shipbuilding projects will be persistent over time. Consequently, part of our results which we claim to be evidence of network learning could also be interpreted as network change. Studying concepts such as learning and coordination on a network level constitutes significant methodological difficulties. In order to advance our knowledge on these topics, research should also reflect on

appropriate methodologies to apply. Such methodologies should preferably address behavioral and cognitive change or other distinctive types of change in order to draw conclusions on learning. In Chapter Four and Five we combined observational data with interview data. This is not without concern as one can more easily grasp the meaning of the data during interviews than that of observations made during construction meetings. During an interview the respondent is focused on the interviewer whereas when making observations the respondents are focused on each other, and there is at that moment no opportunity to test interpretations by deeper questioning. To be able to combine these types of data the researcher in question should become an 'insider' in the research context. We did so by becoming an embedded researcher and frequently visit the shipbuilding projects under study, getting tours on board the vessels under construction and gaining in-depth knowledge from actors on the projects besides the interviews and observations. Besides these methodological issues, studying multi-organizational projects constitutes a significant challenge. With regard to learning more research of a longitudinal nature will likely provide valuable insights; whereas empirically investigating concepts on a network-level implies the availability of multi-organizational projects. This requires a tremendous effort with regard to data collection and analysis. This might explain why our understanding of coordination in multi-organizational projects has remained limited so far.

Second, although the Dutch shipbuilding case is exemplary for many types of industrial construction, transferability of the results of this dissertation to other settings should be done with caution. For

example, technical complexity was found to be influential in several cases we studied but may not be a general denominator having the same influence on collaboration across industries. Assuming the same influence of technical complexity across industries ignores the interrelatedness with other conditions and characteristics specific to Dutch shipbuilding projects which we have shown in this dissertation.

In the introduction chapter we pointed at the system integrator which has to understand the entire system for purposes of design and coordination. Although in this dissertation the shipyard is often thought of as the system integrator, future research might fruitfully explore this concept more generally in other industries and in relation to the notion of meta-organizations which "comprise networks of firms or individuals not bound by authority based on employment relationships, but characterized by a system-level goal" (Gulati et. al, 2002, p. 573). Future research could explore whether this system integrator has to be a single organization or that responsibility for system integration lies at a higher level with the meta-organization. Even more, the interior processes of such meta-organizations will provide fertile ground for future research. Processes of coordination and mutual adaptation will likely look different across industries. For example 'teaming' (Edmondson, 2012) in which collaboration becomes significant more flexible between organizations as well as individuals will provide guidance in studying processes of meta-organizations.

The Dutch shipbuilding industry constitutes a specialized, historically determined, traditional industry which served as a suitable exploration ground for research on multi-organizational settings due to its temporary nature and task related interdependence between

participants. However, in order to further develop our understanding of coordinating multi-organizational projects, future research might investigate whether our conclusions also hold for settings other than the Dutch shipbuilding industry. The relevance of such research is undeniable in light of the wide-spread adoption in recent years of the multi-organizational project.

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Appendices

Semi-structured Interview protocol Chapter four

Roland Levering – Project S1

- What is your job title and how did your career develop?
- Was there ambiguity concerning operational adjustment? How was that solved?
- With which parties did you mostly consult?
- How do you deal with external parties in comparison with internal parties?
- What is your opinion on the role of the client in the construction process?
- How strong is in your opinion the so-called 'copy effect'? How does it work?
- What is the balance between formal and informal adjustment?
- From which other actor did you learn the most? Which actor learned from you?
- To what extent are there formal evaluations? Between which actors?

- Were there any exceptions on this project as compared to other projects?

- Is there room for improvement? Where?

- Do you have any further comments or questions?

Thank you for your time!

Semi-structured Interview Protocol Chapter five

Roland Levering – Project D1/D2

- What is your job title and how did your career develop?

- How would you grade the collaboration between the parties on project D1? Why this grade?
  Did you have a specific collaboration partner in mind?

- How would you grade the collaboration between the parties on project D2? Why this grade?
  Did you have a specific collaboration partner in mind?

Clear division of tasks and responsibilities

- Was it clear to you who were responsible for which tasks on project D1?

- Was it clear to you who were responsible for which tasks on project D2?
  Do you see any differences between the two projects? Why?

Flexibility

- Did the actors on project D1 interact flexibly with each other?

- Did the actors on project D2 interact flexibly with each other?
  Do you see any differences between the two projects? Why?

Transparent and frequent communication

- How would you describe the communication between the actors on project D1?

- How would you describe the communication between the actors on project D2?
  Do you see any differences between the two projects? Why?

Acknowledgement of, and acting upon the common goal

- Did the actors acknowledge the project interest of project D1? Did the actors act in line with this project interest?

- Did the actors acknowledge the project interest of project D2? Did the actors act in line with this project interest?
  Do you see any differences between the two projects? Why?

Relationships of mutual respect, understanding and trust

- Did you see the respect that was mentioned during construction meetings on project D1?

- Did you see the respect that was mentioned during construction meetings on project D2?
  Do you see any differences between the two projects? Why?

- Is there to your opinion a so-called 'copy effect'? Why?

- Are there any other similarities or differences between project D1 and D2 that we did not discuss so far?

O Do you have any further comments or questions?

Thank you for your time!

OBSERVATION PROTOCOL

Chapters four and five

Observation Details *Meeting type / Date* Start time End time	
Descriptive notes	**Reflective notes**